THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
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A PLANT FOR THE MANUFACTURE OF LARGE MANGANESE BRONZE CASTINGS

A Few Facts Concerning an Enterprising Concern Making Big Castings in a Small Plant.

The plant of the American Manganese Bronze Company at Holmesburg Junction, a few miles outside of Philadelphia, Pa., does not impress one with its size, but when the castings that are turned out there are seen, the observer is impressed with its importance in the metal field. The plant itself consists of a foundry 50 by 240 feet in size, a view of which is shown in the first picture, a pattern shop 30 by 100 feet, forging shop, machine shop, and office building. The foundry is one of the best equipped of its kind for the making of large and difficult castings of manganese bronze and "tensilite," which is one of the company's own specialties. The foundry is capable of producing 48,000 pounds of metal per day, is equipped with ten and fifteen-ton cranes, two electric jib cranes, ample furnace capacity, and gives employment to from 60 to 75 men.

The American Manganese Company is composed of W. A. Locke, president and treasurer, in charge of the New York office at 99 John street, and C. R. Spare, vice-president and superintendent. Mr. Spare, who is a metallurgist of note, is the originator of a number of special alloys which have become famous for their remarkable mechanical and chemical properties. Among these alloys in which the company specializes may be mentioned Spare's manganese, white and hydraulic bronzes, all of which are made at Holmesburg in the form of billets, ingots, castings of intricate design, and forgings of every description. Nothing seems to be too large or too diffi-

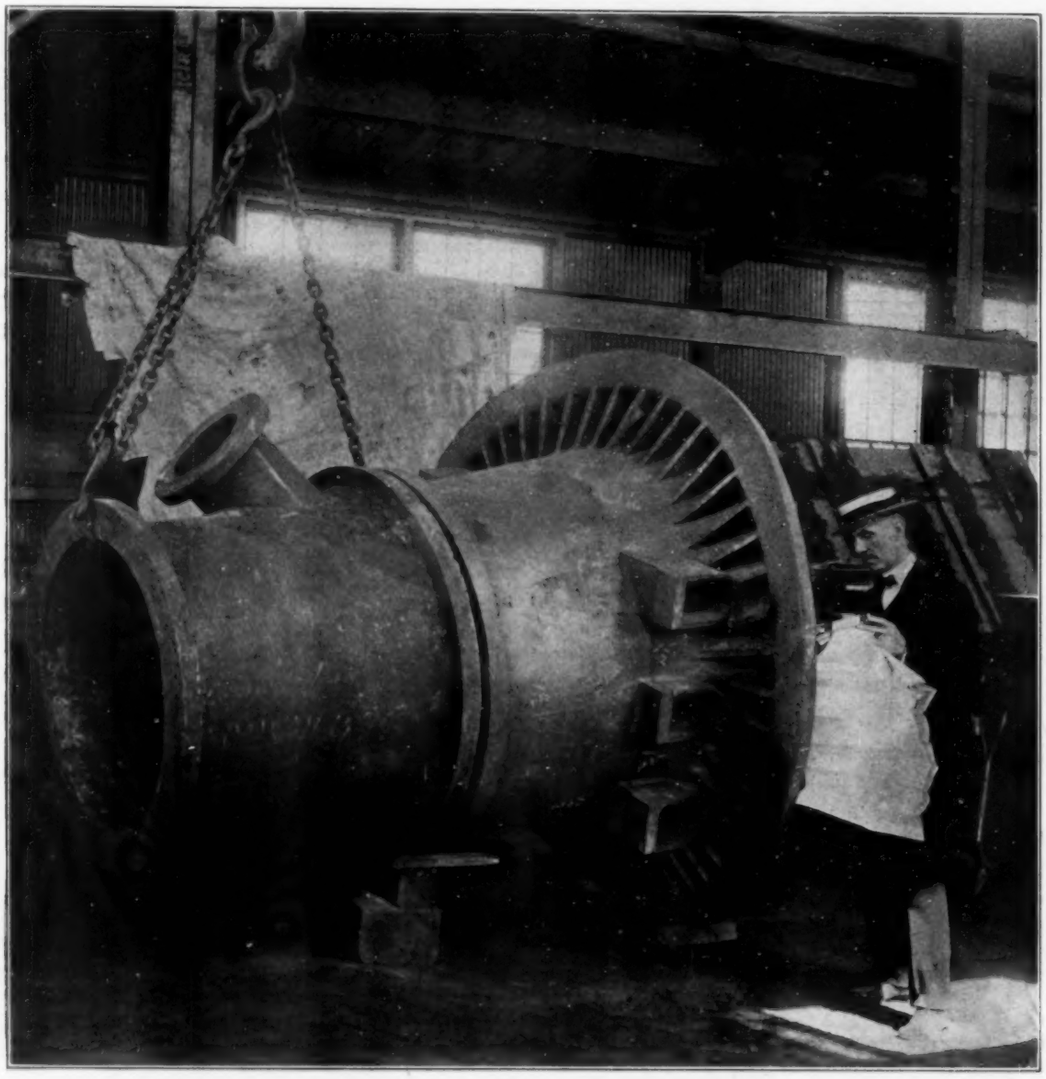
THE FOUNDRY OF THE AMERICAN MANGANESE BRONZE COMPANY AT HOLMESBURG, PA.

cult for this company to undertake, and some of the work turned out at Holmesburg has excited the wonder and admiration of all who have seen it.

The casting shown in our second picture has just been turned out by the company and is part of a 40-inch blow-off valve to be used in the inverted siphon of the Hudson River crossing of the New York City water supply. This particular casting weighs 15,000 pounds, is seven feet six inches long and has a small diameter of four feet and a large diameter of seven feet six inches. The valve that this casting is a part of was shown in THE METAL INDUSTRY, September, 1912. The hydrostatic pressure test that the valve must meet is 350 pounds per square inch and must work under a pressure of 175 pounds per square inch with a 400-foot head and a velocity flow of 150 feet of water per second.

The American Manganese Bronze Company besides other large work that keeps its foundry busy in these dull times is now working on contract No. 84 of the New York Board of Water Supply. This contract includes twenty-five distributing caps in the form of a tee with 48-inch diameter bottom inlet with two 30-inch diameter outlets and a removable cap, weighing over 10,000 pounds each, and six caps with 72-inch bottom inlet and two 48-inch outlets weighing over 25,000 pounds each; the latter being the largest manganese bronze castings, other than propeller wheels, ever designed.

One of these large castings has been cast and is now at the plant of the Chapman Valve Company, Indian Orchard, Mass., where it is being finished, preparatory to its shipment to the Catskill reservoir. We hope to present a picture of it at an early date.



MANGANESE BRONZE CASTING WEIGHING 15,000 POUNDS FOR BL OW-OFF MOUTH PIECE ON THE HUDSON SYPHON, NEW YORK CITY WATER SUPPLY, MANUFACTURED BY AMERICAN MANGANESE BRONZE COMPANY, HOLMESBURG, PA.

LIQUID ALUMINUM.

According to the "Mining Journal," London, experiments made to bring aluminum to a liquid condition so that it may be spread when cold over any dry surface have, according to the German press, been crowned with success. The composition is applied like paint with a brush and looks, when spread, like a dull silver coating. It is said to be an excellent preventive of rust, to be resistant to heat, elastic, durable and resistant to atmospheric influences, and to form an excellent substitute for tin in plating.

THE BACK OF THE SHOP

SOME REMARKS CALLING ATTENTION TO AN IMPORTANT FACTOR OF EVERY SHOP THAT IS GENERALLY OVERLOOKED.

BY JAMES F. DEITER.

How many articles in our various papers, printed for the benefit of us foundrymen, have ever touched on the following subject in this manner? I do not want any one to misconstrue my meaning in any way, but, for a little trip that will surely benefit some of us, let us take a visitor through the foundry. In the supposed now up-to-date shops, he gains his entrance through the nicely furnished offices, where he receives his pass, which entitles him to see the foundry from beginning to end. He next steps into the foundry. Here the men are working with conditions perhaps not the best, but they are pretty well supplied with light, room and heat. The tools furnished by the company, such as brushes, shovels, and sprayers, all look practically new. The visitor's attention is first drawn to the piles of castings that have been placed back of the various floors. He closely watches the course of construction of the different molds. His attention is particularly called to a large mold almost finished. He looks at it and asks: "How is that made?" The superintendent, who is personally conducting him through the works, points to the large molding machine and requests the visitor to wait until the next one is made.

The men, who are ramming up, have almost finished; in a few minutes the bottom board is slapped on; clamps tightened with one turn; the lever is thrown over; up she comes and over she goes. In another minute out comes the pattern with the usual noise of the vibrators and, as it swings up in the air, the visitor exclaims: "Why! that is only a block of wood." "Yes, only a block of wood, but wait until you see the cores set, then you will see one of the most complicated and difficult crank cases made."

"Cores," the visitor says. "What are they?" "Why, they make the inside of the casting; the bearings, the oilers, the ribs, the cam shaft, also contain the bosses, and in fact the vital parts of the crank case are made by the cores." "Is that possible? Where are they made?" "Why, in the core room." "Where is that?" "AT THE BACK OF THE SHOP."

Yes, my foundry friends, how true this is. The core room is most always at the back of the shop, with about four or five windows, under the lowest roof, next to the big oven cars, where the heat comes pouring out on the men in the hot summer days, and there is where the most vital part of foundry success and prosperity is situated. So, the visitor passes on, but let us linger, foundry friends, at the back of the shop a little longer. You will all agree with me that the majority of foundrymen do not stop to consider the core room or give the core makers the credit that is their due. How many shiny shovels do you see in the core room? Did you ever see a "brand new" shovel in a core room? If so, one of the helpers certainly took it from the foundry. How many new riddles go to the core room? A very few. But still the foundry superintendent will come to the core room foreman to inquire, "How many can you get off this job today?" "They are going to get ——— in the foundry." "Make them hustle; get them out—they are nothing but bricks." But what a cry when one of those bricks causes the loss of a valuable casting. So, why not get busy, foundry friends, and bring the foundry and core room together. Stop and think before you speak; just consider that one is as good as the other.

When you hear a foundry superintendent make this remark: "I think more of my core room than I do of my foundry," you look at this man's success, look him up close and you will find that he is having success. I will admit that a core maker will work all his life and the company can never make any profit off the holes he makes in the castings, but he is the mechanic of the foundry today. Where does the customer look at his castings? Inside, every time. So that is what they are looking for —fine core work. You can grind the outside of a casting and polish it with ease, but it costs money to polish the inside. So, give your core room everything to work with; keep the core makers under conditions that will enable them to go the pace, but turn out work that is a picture to the eye and a credit to the foundry. But again how often is the core maker credited with bad work when the core leaves the core room; how often to enable the molder to make greater speed. Perhaps piece working he takes the file and off goes a hunk, and no thought is given to the fact that the core room loses more prestige with the customer. If you expect your core makers to carry their own cores and load them on the cars and in the ovens, you must expect less work or much inferior work. I have always tried to furnish helpers to carry the cores, bring the rods, wire, nails and chills to the core makers, and I think, in fact, I know, a better class of work has been produced.

Another time saver in the core room is the spraying and blacking of the cores. I have a man that does all the spraying, but many a good day's work have I done where the core makers sprayed and blackened their own cores. But one good man kept on the job, in a few days will give cards and spades to us all. There is just as much science in painting the core and giving it the proper thickness of core wash, as there is in making it, and many a casting has been lost, when working under one-eighth of metal, by too much core wash being used.

Now we have the cores made, sprayed and in the ovens. In a few hours they will be dried, when they are brought out of the ovens. Do your core makers do it, or do the helpers? Do your core makers fit and finish, or have you a special man or gang to do this work? I have found that finishing and fitting up cores ready for the mold was pretty near a trade by itself and by taking a bright young man and teaching him what a core was for and where and how it should go, I started cutting my cost, and you would be surprised today to see this part of my core room working, handling hot cores with perfect ease and fitting them up to perfection.

There is no need of going into the sand mixing room, as every one has his own pet mixtures, but it has been my experience that it pays to keep your eye on the sand heap and not let the cleanings from the foundry mash be dumped in your core sand, for when that is done look out for blow holes and trouble. Some men use the old molding sand to some extent with great success, but I have seen a few mistakes made in using it too long. Do not figure too close on the first cost of a core, get the sand to suit the job and then go ahead.

DETINNING BACK DIVIDENDS.

Preferred stockholders of the Vulcan Detinning Co. have been formally notified of the decision of the directors to pay 21 per cent. accumulated dividend on the preferred stock as soon as the money from the judgment against the American Can Co. is collected.

THE PROPER CARE OF MACHINES AND TOOLS IN THE MANUFACTURE OF BRASS AND METAL GOODS

SOME REMARKS REGARDING THE CAUSES OF TROUBLE AND SOME SUGGESTIONS AS TO REMEDIES.

BY P. W. BLAIR.*

Considerable expense and trouble have been caused to manufacturers of the above line of goods through lack of understanding mechanically, and the amount of unskilled labor being used in the manufacture of the above line of goods. Manufacturers in all lines are fast realizing the importance of employing mechanics of a higher order, or educating their employees to a better understanding of the value of tools, their proper upkeep and the necessary conditions of operation to insure desirable and satisfactory product, and this has become quite necessary in order to compete with the modern and up-to-date plants in operation today, in which costly machines and tools are intrusted to the care of unskilled employees who through ignorance or carelessness soon have the machines or tools out of commission. Whereas a good mechanic who has had proper training and instruction takes a natural pride in a good tool or machine and will do his utmost to keep same in good working order and sees that it is not misused or abused.

In my own visits to manufacturing plants I have witnessed many very fine examples of the care and operation of machine equipment, and have also witnessed quite as many extremely bad examples. It is especially with the bad examples and the remedies that I wish to treat of in this article and more particularly with the troubles experienced in the operation of tools for cutting, boring and screw threads, as applied to turret and automatic screw machines. In some plants I have witnessed screw machine operators use a heavy hammer or wrench for driving the turret tools out or into the turret. Possibly the shank of the tool was slightly large for the turret hole, or it may be that the operator had not sufficiently loosened the binding screw to permit easy access for the shank of the tool, and the operator lacking in mechanical knowledge, and caring little about the tools anyway, drives them into the turret holes and then drives them out again until the tool has the appearance of having been used in a smith shop for a striking hammer. Of course this treatment very quickly springs the tool shank and puts the tool in so deplorable condition that good work is impossible, and if it shows up with no marks the next time it is put in use some one blames the manufacturer of the tool, reports that it is no good and will not do satisfactory work. Doubtless the man who writes the letters of complaint has no knowledge whatever of the true conditions, and his information comes from the machine operator through the foreman of the job and the superintendent, and in many cases the machine operator is the only man who really knows what the real conditions are, and often he is too ignorant to fully appreciate the cause of the condition. For he has never been instructed not to use a hammer in applying the tools to the turret, and how is he to get the tools into the turret holes if he does not use a hammer or anything that is handy to drive with? The tools were turned over to him to use on that machine and if the shanks happen to be slightly too large for the turret holes, or he does not happen to loosen the binding or set screw quite enough to give the shank access, his instinct tells him to take a hammer and drive it in or out and besides it did not cost him anything, so what difference does it make? The boss will buy another one when this one is worn out.

When the superintendent investigates the cause of so much damage to tools and machines he is sometimes very much surprised, but he has so many things to look after that it is quite impossible for him to look after those small details. The foreman on the job is generally taken to task for allowing these things to happen or such conditions to exist, but he is busy too with many duties, and can not give personal attention to or see everything that happens. Something ultimately has to be done to overcome this condition which must bring about a system of examination of tools when delivered from tool storage to the operators at the different machines when issuing same, and more especially when the operator is done with same, and when returned to tool storage to see if any tools have been abused or damaged. The successful operation of any tool employed for the boring, facing and cutting of screw threads, and this is equally true of forming tools, depends on their proper grinding and sharpening; in fact this is one of the most important essentials to successful operation and satisfactory work. In many plants all tools are kept in a well appointed tool room and there cared for by experienced mechanics, the machine operators not being allowed to grind or otherwise change any tool. This work should all be done in the tool room, and under such conditions there is seldom cause for complaint.

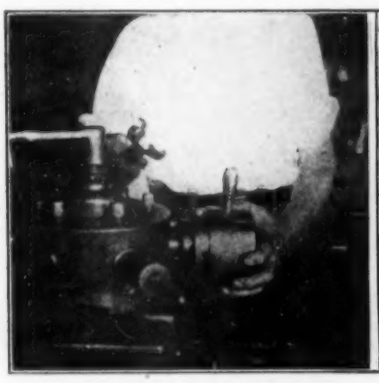


Fig. 1. Adjusting a Geometric die head in a turret lathe. The wrong method, using a wrench.

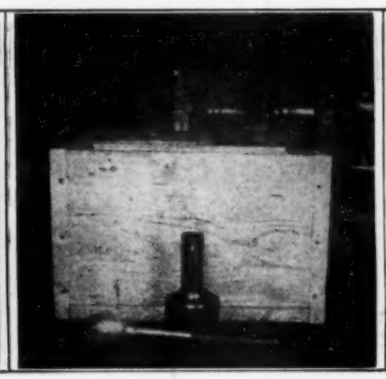


Fig. 2. A tap holder ruined on the end by being held on the extreme end by a set screw.

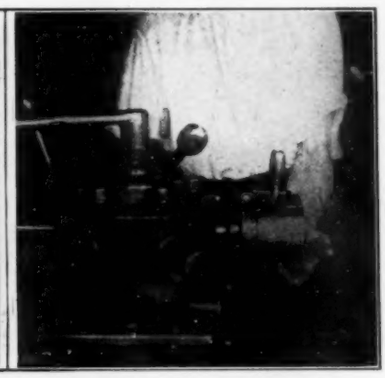


Fig. 3. The correct way to adjust a die head, using a lead mallet. Note the position of the left hand.

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REMEDIES RECOMMENDED.

The best remedy I can recommend for the present abuse of tools in many plants is better factory organization which looks to the proper care of all tools and machines in a competent and well equipped tool room. Another remedy I can recommend is a book of instructions which should be issued to every employee entering or in the employ of firm, title of same, "The Proper Care of Tools and Machines." I have seen this applied to large brass manufacturing plant employing 900 employees and good results have been obtained from same. A wise man will hear and will increase his learning but fools despise wisdom and instructions. This book can be made to measure three by five inches. The introduction should come first specifying the reason why the book was gotten up by the firm. It should then embody information and instructions about as follows:

Before beginning work, a workman should carefully examine all his tools when received by him from the tool room, and report to his foreman if they are not in first-class condition. If he fails to do this such defective tools must be charged against him.

Oil the machine every morning the first thing, as it works in a more satisfactory way. Under no condition use a file as a hammer, chisel or a pry. Should not use a monkey wrench for the same purpose as a hammer.

A wrench used on the head of a bolt, screw, or in fact anything that has a square must fit this square closely or it will gradually round off the corners.

When the chucks are put on the spindle of lathes or machines, be sure that the threads on the spindles and in the chucks are cleaned of all chips and foreign matter, and oiled. Then screw the chuck on by hand one-quarter turn of the shoulder and give it a quick turn with the hand against the shoulder, which will tighten it sufficiently to keep it in place without causing any trouble when it is taken off. At least once in every forty-eight hours the chucks should be oiled in their working parts. In using collets on air chucks see that all chips are out of spindle lathe or collet, screwing them in.

When putting jaws into a chuck, both jaws and chuck must be perfectly clean and free from chips. The chuck should then be opened up wide enough to allow the hand to pass in under the false jaws, then start the screw into the jaws and screw it up as far as possible with the fingers. After inserting both jaws in this way, screw up the chuck until the false jaws come together and press firmly into the tongue and groove. This will release the chuck screw enough to allow you to tap on the face of the jaws with a piece of lead for the purpose of making them set even on the front face. Never use any hard material for this purpose for it will mar the face of the jaws. After this is done screw up the chuck screw until you have firmly gripped both jaws, then screw up both jaws tightly with a screw driver.

All working parts of the tools should be kept well oiled.

The shanks of the tools should also be oiled and wiped lightly before inserting, so as to keep them from rusting if they are left in the machine for any length of time.

All holes in the turret of a machine not occupied by tools should be kept plugged up with wooden plugs, so that chips will not enter and get into the working parts.

Gauges and templets of all kinds must be handled with care. Never force a piece of work into a gauge. Do not slip a ring gauge over a set screw on your machine for the jolting or jarring of the machine will cause it to work on the set screw and gradually spoil the gauge.

Threaded plug gauges, after you have tested your work, should be screwed into a cap in order to keep the threads well protected.

Never accept a taper shank drill from the tool-keeper when it has a broken or distorted tang. It may become loose and damage the socket.

When taking the chuck jaws out of a chuck loosen the screws in the jaws, and if they still hang tightly, insert a screw driver into the chuck and pry on the jaws, which will loosen them.

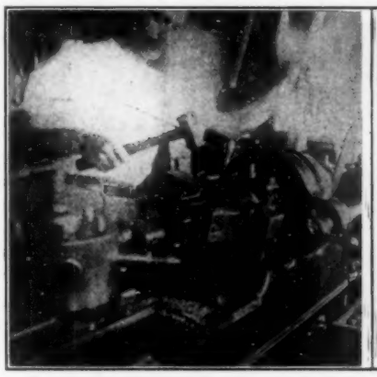

Fig. 4. Wrong method of removing box chuck from lathe using a hammer.

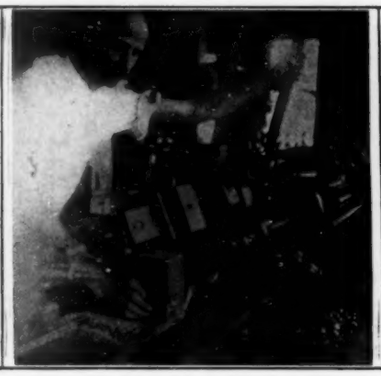

Fig. 5. Correct method of removing box chuck, using hardwood block.

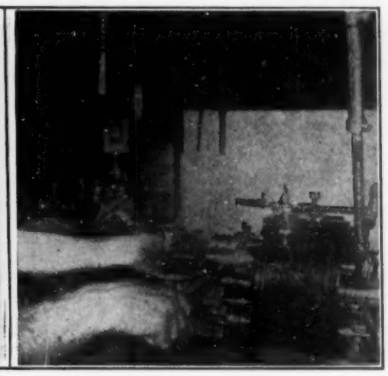

Fig. 6. Correct method of taking box-tool out of automatic screw machine that is wedged in, using a hexagon brass rod.

Do not start a machine without knowing everything is ready.

Do not do any unnecessary hammering on a drill-press table.

Always oil the screw collar on a vise once a week if in constant use.

Do not do any hammering on any machine if it can possibly be avoided.

Do not hold a tool of any kind on an emery wheel until it gets blue.

In quite a number of factories the machine operators are expected to keep the tools in working condition and whether they are competent to do so is a question not considered at all times by the management. There may be a four foot grindstone provided by the management for the purpose of grinding everything from lathe and planer tools to No. 60 twist drills, and it is a good grindstone, or, there may be a 24-inch emery wheel used for sagging iron castings and incidentally for grinding everything, and it is a good emery wheel and cuts well. Now there are certain requirements in the proper grinding of dies or chasers

and reamers, also mills, which must be observed if good work is to be expected. In the first place, as an illustration: two, four, six or more dies are employed in a die head, as the conditions of the work may require, and these dies are known as a set, and if a set of dies are expected to lead unto the work and make a satisfactory screw thread it is most essential that all of the dies must be ground uniformly. If one die is ground back in the front or throat, the remaining dies of the set must be ground back to exactly the same point so that when brought up to the work each die will start cutting at the same time and each do its share of the work, for if one die is ground back in the throat a greater distance than the others it is obvious that they can not all meet the work evenly, and the result can not be satisfactory. The same applies when the chasers are ground on top, the thickness not being uniform. When one die is cutting ahead of the other or doing all of the work and not evenly distributed, an imperfect thread is the result for one die more than its equal share of the cutting and at the same time tends to force the work out of center which also makes a bad condition worse.

Do not run a machine when any part of it is out of order, without notifying your foreman.

Do not forget that a cutting-off tool should have equal clearance on both sides.

Do not blow filings or chips in among the running parts of a machine.

Tools must not be forced into the turret of a lathe for the reason that it is very difficult to remove them after they have been forced into position. Then, too, there is danger that the hole will be enlarged after frequent use, which would make it unfit for use with the regular tools.

Tools must fit in loosely so that they can be inserted by hand. If the tools do not fit in this way, the foreman must be called and he should see that the tools are made to fit properly.

Always see that your tools line up on center when starting a new job.

If a tool becomes fast in the turret be sure that you do not injure it or the machine in trying to remove it. Try some of the following rules and if your efforts do not meet with success call your foreman.

For centers. If after loosening the set screw you are unable to remove the center by hand take a block of lead and tap it lightly. Do not rap it too hard as you will strain the center. If there is a flat on the center you can use a monkey wrench to give the center a turn. This, however, applies to centers in monitor lathes.

Centers in spindles should be driven out with a rod put into the hollow of the spindle.

Tool holders. These should be treated about the same as centers, except that you can generally get a monkey or Stillson wrench around the holder to the set screw, in order to give it a turn or use it at the back so as to act as a wedge and force it straight out.

Tap holders. The last piece of every job should not be taken out of the chuck until you have tried to extract the tap holder from the turret. If too light to remove by hand, the tap in the holder should be screwed into this piece of work. Next loosen the set screw holding the tap holder in the turret, run the carriage back and pull the tap holder out of the turret. This same rule applies to the adjusting of the tap holder in or out of the turret when adjusting it to work in connection with the templet.

Die heads. The last piece of a job should also be saved until you have determined that you can take out the die head by hand. If too light for this purpose run the die head onto the thread, loosen the set screw that holds the die head into the turret, hold the lever of the die head so that the chasers will not open up, and run the carriage back so that die head is pulled out of the turret.

Chasers. A bar of lead or a piece of wood should be used to tap lightly the chasers that cannot be extracted from the die head.

A wrench, hammer or any hard material, such as brass, iron or steel should never be used to adjust your tools in or out of the turret, even to a fraction of an inch. Tap the tools lightly with a bar of lead whenever necessary. No hard material of any kind should lie on the ways or bed of a lathe. The bed or shears should be covered with a smooth board.

When putting a tool in the turret or holder, special care should be taken to turn the flat side of the shank so that the set screw will rest on it. If the set screw is screwed down on the round part of the shank it will spread out the shank and cause a lump to appear, which will cause the shank to fit tightly in the hole. The set screw should never be allowed to rest on the extreme end of the shank for it will tip the tool out of the center and allow it to creep from under the set screw, and run shank on end.

Always use square hard wood or lead block when taking off a box-chuck.

Do not be contented with just knowing what "Shop Kinks" you have learned from someone else, but investigate and work out a few for yourself.

DIP PROCESS FOR MATTING ALUMINUM

By Robert Grimshaw.

Aluminum has unfortunately one property which is not possessed by others of the ordinary metals—that it is attacked by alkalies (zinc is somewhat affected thereby, but by no means in the same degree as aluminum). Fortunately we may utilize this property in "matting" articles of aluminum—for instance by dipping them in a solution of caustic soda. The result is the evolution of hydrogen, just as where zinc is dipped in dilute sulphoric acid, and the aluminum is slowly changed to sodium aluminate. When the action takes place in too short a time, the result is simply "matting" the surface so that it has a "moiré" appearance.

The solution should consist of one part of soda to ten of water; the articles are previously to be well cleaned and rinsed. When there is a liberal development of gas bubbles, the articles should be taken out and rinsed in cold water. The black coating which may be seen will consist of iron (fluor spar in the aluminum makes also a black compound, but the soda removes it). The iron is removed by dipping the articles in a mixture of equal bulks of water and sulphuric acid, which has been let get cool after mixing. After this, they are to be rinsed again in cold water. This process is recommended only for articles of small surface.

Another process consists in first polishing the articles, cleaning them with benzine and dipping them in a strong boiling solution of potash until the surface is matt and white, then rinsing in cold water and next dipping them five to six minutes in a five per cent. solution of fluoric acid to soften the surface. Then they are to be rinsed in cold water and next dipped in a mixture of equal parts of sulphuric and nitric acids. Finally, they are to be rinsed in cold, clean water in two successive separate vessels, and dried in sawdust that is free from rosin or pitch (for instance, birch or ash). They must not be touched with the naked hand. They may then be matted with a steel wire brush six inches in diameter, making 2,500 turns a minute; care being taken not to use new brushes, but those that have been well used in other service. Aluminum is too soft for sand blast matting.

THE ELECTRODEPOSITION OF NICKEL*

A Paper Giving a Resumé of Past and Current Practice in the Art of Depositing Nickel on Metallic Bases.

By Oliver P. Watts.†

(Continued from June.)

PURITY OF NICKEL ANODES.

Calhane and Gammage analyzed commercial anodes from two different establishments and found 7.57 and 7.52 per cent. iron in them, and 92 per cent. nickel. Using these anodes, the deposit always contained iron, varying in amount between 0.07 and 0.75 per cent.

The following is a formula given for the making of nickel anodes: 92 parts nickel, 4 parts tin, 4 parts old files.

O. W. Brown finds copper present in a nickel anode: "The presence of the copper, rather than being a detriment, seems to be advantageous in allowing a high anode current density to be used.

"Commercial nickel anodes contain, in addition to nickel, iron, tin and carbon. These are introduced intentionally to render the anode 'soft,' *i. e.*, so that it will dissolve easily in the solution during plating."

Since such anodes are largely used in this country it is evident that much of the nickel plate produced here contains a small amount of iron. It is to this iron that Bancroft ascribes the ready rusting of nickel-plated objects when exposed to the weather: ". . . All our nickel plate contains iron. I am confirmed in that belief by the fact that the nickel-plating on the Weston instruments, which I assume to be as good as any that would be put on the market, rusts red in the laboratory. I take it that this is due to iron in the nickel plate. . . . If a bicycle is left out over night it will rust. The writer does not regard the above allegations as proved until rust has formed on such nickel plate deposited on copper or some other surface which is in itself entirely free from iron.

PASSIVITY OF NICKEL ANODES.

It has long been known that rolled nickel anodes do not dissolve satisfactorily in the standard plating solution, nickel ammonium sulphate. This phenomenon was brought to the attention of this Society by O. W. Brown. Brochet says: "Nickel is a passive metal, that is to say, that to a certain degree and under certain conditions it dissolves incompletely and acts as a noble metal—as an insoluble anode. Sulphuric acid is then formed at the anode, and nickel dissolves in an amount less than that required by Faraday's law." Speaking of nickel anodes, McMillan says: "Nickel anodes must be as pure as it is possible to obtain them. They are to be had cast or rolled. Cast anodes being the more readily soluble are more likely to neutralize the acid set free by electrolysis at the anode, and hence the natural tendency of the (ammoniacal) nickel bath to become alkaline asserts itself. Rolled anodes are more likely, by insufficiently neutralizing the acid, to cause the bath to become acid." Bancroft points out that a pure nickel anode may be made to corrode satisfactorily in nickel ammonium sulphate by adding to the solution a small percentage of nickel chloride or ammonium chloride. He recommends the use of anodes of pure nickel and the complete elimination of iron from the nickel bath. Brochet says: "The greater or less passivity of the anode depends on the physical nature of the metal, *i. e.*, the hammering or rolling to which it has been subjected, not on its purity."

On the contrary, Kern says: "Another cause of gassing is the use of pure metal anodes in nickel-ammonium sulphate electrolyte, as the pure metal does not readily dissolve. However, pure nickel anodes may be successfully used in this electrolyte if a small amount of chloride salt is added, the presence of which causes the anode current efficiency to approximate 100 per cent." Langbein (pages 254 and 247) objects to the addition of chlorides or nitrates to baths for nickeling iron: "Iron objects nickeled in such a bath come out faultless, but in a short time, even if stored in a dry place, portions of the nickel layer will be observed to peel off, and by closely examining them it will be seen that under the deposit a layer of rust has formed which actually tears the nickel off." E. Weston says: "It has been found that the solution of the double chloride of nickel and ammonium is better adapted for coating iron with nickel than the double sulphate solution, the latter answering better for brass."

In the electrolytic refining of iron the writer found that deposits from a chloride electrolyte rusted very much worse than those obtained from a solution containing only sulphates.

NICKEL PLATING BATHS.

For convenience the baths will be classified as follows:

I. Baths containing single salts of nickel.
II. Baths containing double salts.
III. Miscellaneous baths.
IV. Baths for deposition of malleable nickel.
V. Baths producing thick deposits.
VI. Agents for the production of smooth deposits.
VII. Nickel electrotypes.
VIII. The nickeling of zinc.

BATHS CONTAINING SINGLE SALTS OF NICKEL.

a. NEUTRAL BATHS:

Under this title will be grouped the baths formed by simple solution of the nickel salt without rendering it distinctly acid or alkaline, as well as those baths whose neutrality is specifically stated.

75. Yates' acetate solution. Nickel acetate is dissolved in water to a strength of 8 deg. or 10 deg. Bé. (1.058 to 1.074 sp. g.). It is claimed to have the advantage over other solutions of a larger proportion of metal of not being subject to the irregular decompositions which render the continued operation of other baths so difficult, and to permit of direct nickeling on metals which it has heretofore been impracticable to nickel without a previous coating of copper. Plate steel, cast and wrought iron are mentioned as examples of this. With care, zinc may also be nickeled directly in this bath.

In referring to the fifty different nickel baths tried by Alexander Watt, a number placed in parenthesis after the title of the bath indicates the numbering in his paper.

76. Watt's acetate bath (1). This consisted of 120 grams of neutral nickel acetate per liter. At a current density of 2.4 amperes per square decimeter a uniform but somewhat dark deposit was obtained. At the end of an hour's deposition a steel burnisher was applied, which brightened the surface, showing that the metal was softer than that obtained from the ordinary double sulphate solution.

77. Watt's nickel benzoate (46). This solution yields a bright deposit, soft enough to be burnished.

*A paper presented at the twenty-third General Meeting of the American Electrochemical Society, at Atlantic City, N. J., April 3-5, 1913.

†Department of Applied Electro-Chemistry, University of Wisconsin.

78. Watt's nickel borate solution (48). This yields a white deposit.

79. Nickel chloride solution (22). 15 grams of nickel chloride per liter gave a brisk evolution of hydrogen and a deposit of metal not quite so white nor so fully adherent as the deposit from the double sulphate.

80. Nickel citrate solution (6). This was prepared like most of the other salts of this set of experiments, by digesting moist nickel carbonate with a hot solution of the acid. The first deposit was not of satisfactory whiteness, but this was improved by increasing the current.

81. Nickel lactate (12). This salt is readily soluble, and gives a deposit of fairly good color.

82. Nickel nitrate (16). Nickel carbonate was dissolved in nitric acid diluted with two volumes of water until a neutral solution was obtained. Neither a deposit of metal nor of hydorgen was obtained with one, two or even three Daniell cells in series. There was a slight evolution of oxygen at the anode.

83. J. Mathieu's propionate solution. He used a solution of nickel propionate of about 5 degs. Bé. (sp. g. 1.0357). No results are stated, nor are any claims made in regard to the superlative excellence of the product.

84. Nickel salicylate (47). This gives a white deposit.

85. Nickel sulphate (18). A solution was made by dissolving 100 grams of the crystals per liter of water. The deposit was of good color, but was not so adherent as deposits from the double sulphate of nickel and ammonia.

86. Nickel sulphate, neutralized by lime of calcium carbonate. To 100 parts of an acid aqueous solution of nickel sulphate he adds 3.75 to 7.5 parts of hydrate of lime to exactly neutralize the acidity of the sulphate. To avoid the danger of an excess of alkali he prefers, however, to neutralize by the carbonate of lime. "This solution produces a brighter metallic deposit than the solution in general use, and without the addition of ammonia in any form."

87. Nickel sulphocyanide (20). Moist nickel carbonate was dissolved in a strong solution of potassium sulphocyanide, and this was electrolyzed with the current from three cells. A dark steel-gray deposit was immediately formed, which did not alter during a half hour's deposition. Gas was evolved at both electrodes.

88. Nickel tartrate (11). The solution prepared by digesting moist nickel carbonate in a strong, hot solution of tartaric acid is a poor conductor, and three cells in series were required to produce a deposit of an indifferent color. It was noticed that the cathode became more fully coated with metal on the back than on the front.

b. ACID BATHS:

89. Nickel acetate. The solution contains about 60 grams of nickel acetate per liter, and is maintained strongly acid by acetic acid. "These solutions thus prepared and used do not become depleted in using, and require no addition of nickel to keep up their strength other than that derived from the nickel of the anode."

90. Nickel citrate (26). The solution was prepared by electrolyzing a strong solution of citric acid with a nickel anode. The deposit was very bright, of a good white color, much softer than is usual with nickel, and received a high polish under the steel burnisher.

91. Nickel formate. The solution contains nickel formate with excess of formic acid. Among its claims to merit are: "The solution needs no replenishing with salts of nickel, the nickel being supplied from the anode. No precautions need be taken to see that the solution is free from the presence of potash, soda, alumina, lime or nitric or other acid. The deposit may be of any thickness, and will always be firm, flexible and white."

c. ALKALINE BATHS:

92. Nickel ammonio-acetate (32). Ammonia was added to a strong solution of nickel acetate until the liquid acquired a deep blue color. The deposit was bright, of a good color and very adherent.

93. Nickel ammonio-carbonate (35). Nickel carbonate was dissolved in strong ammonia, diluted and electrolyzed. The deposit was white, and retained its original brightness after an hour's deposition.

94. Nickel carbonate dissolved in a strong solution of ammonium carbonate gave a rather dark deposit.

95. Nickel ammonio-chloride (30). Strong ammonia was added to a solution of nickel chloride until the solution acquired a deep blue color. The deposit was white and very bright. Very little hydrogen, but much oxygen was evolved.

96. Nickel ammonio-citrate (33). Ammonia was added to a strong solution of nickel citrate. The deposit was white, bright and very adherent. The anode kept perfectly clean during the electrolytic action.

97. Nickel ammonio-ferricyanide (45). Nickel ferricyanide was dissolved in strong ammonia. The filtered and diluted solution gave a prompt and fairly white deposit on brass.

98. Nickel hydroxide in ammonia (15). This solution gave a yellowish deposit of nickel, without hydrogen. Oxygen was abundantly evolved at the anode, which became coated with a brownish film.

99. Nickel ammonio-nitrate (31). Excess of strong ammonia was added to a solution of nickel nitrate. The nickel deposit was rather dark in color, and after a half hour the anode had a deep brown color.

100. Nickel ammonio-sulphate (19). An experiment was tried to ascertain the effect of small and increasing additions of ammonia to the sulphate solution. The current from three cells was used, and a fresh brass cathode was used after each addition of ammonia. After the first addition of ammonia the deposit appeared much brighter than that obtained from nickel sulphate alone, and this characteristic was maintained until the solution acquired a deep blue color. The anode was almost black, and a flocculent precipitate formed in the solution.

The evolution of oxygen or the formation of nickel oxide on the anode, mentioned in many cases, indicates that those particular baths are not suited to practical use because of poor corrosion of the anode. In only one case, No. 96, is there mention of good anode corrosion in these alkaline baths.

COPPER IMPORTS AND EXPORTS OF THE UNITED STATES.

Some of the striking changes in the foreign trade of the United States which have occurred during the past decade are illustrated by statements published in a recent issue of the Monthly Summary of Commerce and Finance showing the articles imported and exported in each calendar year from 1902 to 1912. Copper imports show a very large increase, this increase being especially noteworthy in view of the fact that the United States produces half the world's copper and does not, therefore, need to import copper for her own use; this increase in importations, from 103 million pounds of copper pigs, ingots and bars in 1902 to 305 million in 1912, being largely accounted for by the fact that the metal in question was sent to the United States by reason of its superior facilities for refining the copper and extracting the precious metals. Copper exports have doubled, from 355 million dollars in 1902 to 775 million in 1912.

A STUDY OF BEARING METALS AND METHODS OF TESTING *

An Instructive Article Dealing with Research Work in Babbitt Metals.

By T. D. Lynch.

One does not have to go very far into the study of materials for use in the construction or maintenance of machinery until the question of the proper bearing material is presented. Shall it be made of solid bronze or shall it be made of a bronze or cast-iron shell lined with babbitt? If the latter, what shall the composition of the lining be and how can it be tested?

The discussion following will be confined primarily to the babbitted type of bearing with special reference to the importance of proper heat treatment in order to produce a good babbitt and further to the description of certain tests that have been made in connection with the study of the subject.

The introduction of lined bearings dates back to Sir Isaac Babbitt who first used a composition containing approximately 90 per cent. of tin, the remainder being

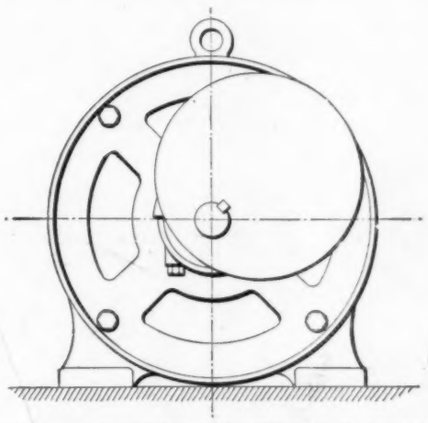

FIG. 1. TEST MOTOR FOR TESTING BEARINGS.

copper and antimony. This babbitt is sometimes known as "Genuine A-1," and when properly made is tough, hard, has a low melting point, good anti-frictional qualities and is more nearly fool-proof than any other babbitt in use. It has therefore become a valuable standard for the comparison of quality. However, the price of tin has become so high (approximately 50 cents per pound), that the problem of a substitute for the A-1 babbitt has become of great commercial importance; so much so that almost every conceivable formula of tin, lead, antimony, copper, zinc and nickel have been suggested and many of them tried in service as a substitute for the A-1. Some of these have met with success while others have met with very marked failure. This infinite variety of possible compositions, together with varying temperatures and hit-or-miss methods of handling the material, has produced innumerable variations in the efficiency of the product.

Both laboratory and service tests have shown that good results may be had with the lead-base as well as the tin-base babbitts, so the problem reduces itself to a study of the conditions necessary to produce certain anti-frictional and mechanical qualities, and of the methods of testing for them.

During recent years we have been conducting a series of tests in the laboratories and works of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, for the purpose of determining some reliable yet practical test that would indicate the essential qualities and give a check on the materials used and on the method of manufacture, by means of which we may learn *why* a certain babbitt should be used, *how* it should

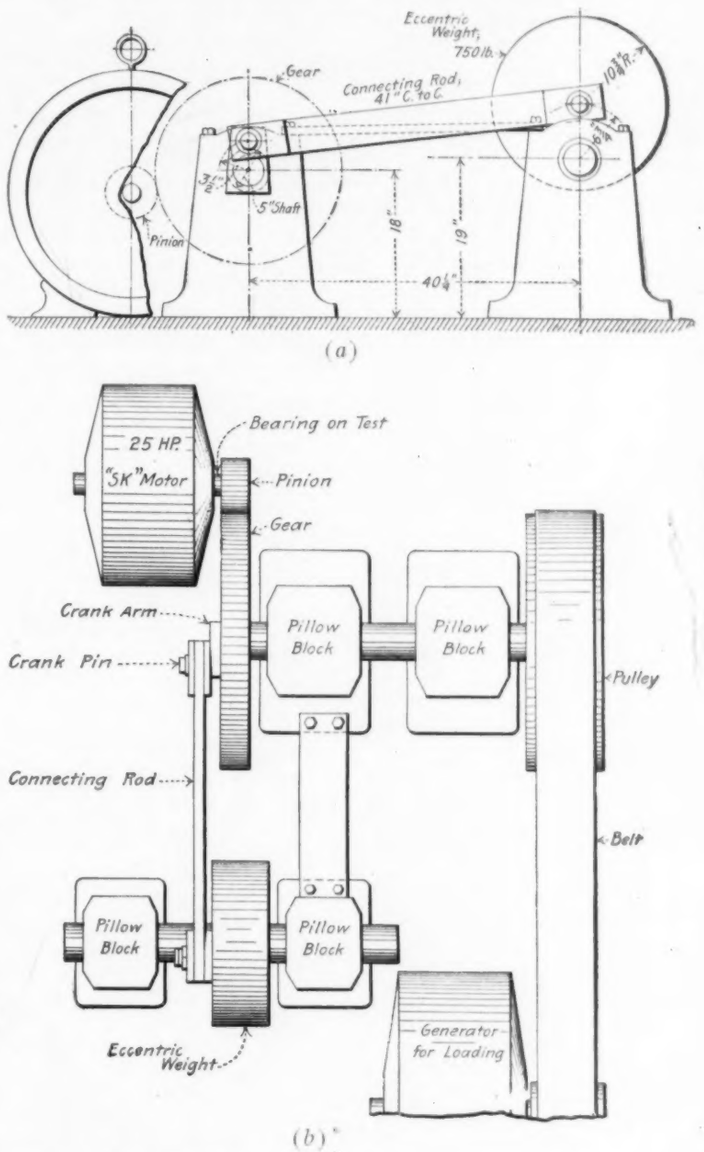

FIG. 2. A 25-H. P. MOTOR ARRANGED TO TEST THE SAME BEARING AS IN FIG. 1.

be treated, and *what* it will do when completed and in service.

The first test was conducted on a well-known friction testing machine, the results of which were not conclusive in that they could not be duplicated from day to day even on the same test sample. The experiences of others were then sought and among them the late Dr. C. B. Dudley was appealed to for a reliable friction test. He replied that he had tried all known laboratory tests and sem-

*Paper read at spring meeting of American Society for Testing Materials, Atlantic City, June 24-28, 1913.

blance of tests, to be convinced that only the service test could so far be relied upon.

We next turned our attention to a practical service test on motors operating under severe shop conditions. Ten motors were selected for the test. They were of varied sizes but all had cast iron shells lined with tin-base babbitt metal. The bearings were all replaced with

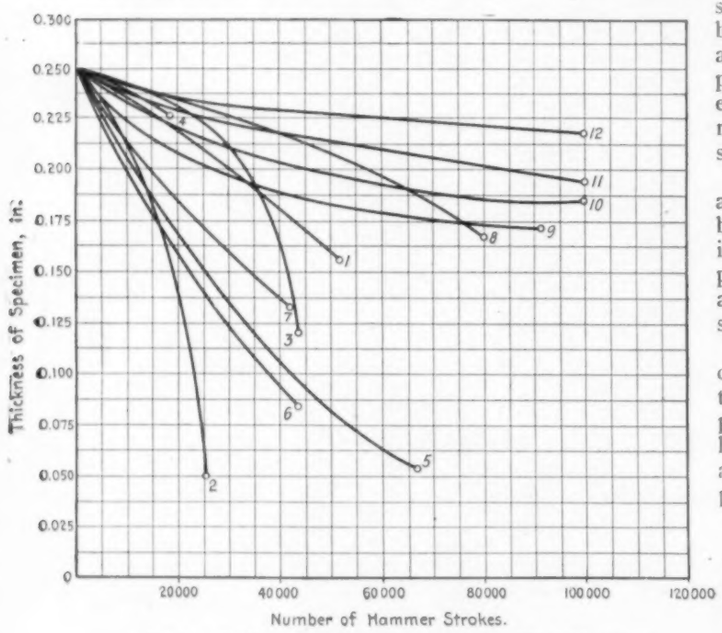

FIG. 3. CURVES SHOWING EFFECT OF TEMPERATURE ON BABBITT METAL.

other bearings lined with the lead-base metal carefully and properly made. In every case the lead-base lining stood up as well and in some cases better than the tin-base lining—the severe conditions under which they were operating remaining the same.

This test was so satisfactory and apparently so conclusive that the lead-base metal was adopted for the bearings of a certain line of motors and accordingly manufacturing was begun under normal shop supervision, but very soon bearing troubles were reported from the test floor. Some of the relatively few bearings which gave trouble were brittle while others were soft and wiped out. The existence of these opposing characteristics of failure in a few bearings, in spite of the good results found in a large majority of the bearings on test as well as under normal service conditions, gave us much concern, and the difficulties encountered shattered the faith so far placed in the lead-base metal, because it was not entirely clear as to what had caused the occasional failure.

In order to determine the underlying causes for these varied characteristics a test to destruction was planned. With this object in view a test bearing was made from a lead-base metal but under careful supervision; each bearing was measured accurately, each set of measurements including five diameters equally spaced at each end and at the middle of the bearing. The bearings were then mounted in a test motor as shown in Fig. 1. The motor selected was a 15-h. p., D. C., variable-speed motor. A 265-lb. weight was mounted eccentrically on the pulley end of the shaft. The motor was run at speeds increased by easy steps until the limit of the motor frame was exceeded and the frame destroyed; yet the bearing remained in good condition.

A second test was planned using the same bearing and a 25-h. p. motor arranged as shown in Fig. 2 (*a*) and (*b*). This motor was back-geared to a counter shaft to which in turn was coupled an arm driving an eccentric weighing 750 lbs., thus producing a shock similar to the effect found in the operation of a rock crusher. A generator was belted to the same counter shaft in order to load the motor in the test. The motor was run light for several days with shock effect only. It was then loaded by steps until excessive overload was reached, which in addition to the continual shock caused by the eccentric produced a condition much more severe than is allowable even in extreme practice. Yet with all this the bearing remained in good condition and check measurements showed negligible wear.

In this connection it may be well to state that there is a distinct difference between bearing metal and bearings because bearing troubles may be due to many causes not inherent in the metal—such as defective alignment, improper lubrication, insufficient clearance, sand in oil, abnormal belt pull, etc., all of which must be considered separately from the bearing metal itself.

No definite measure of quality could be deducted nor conclusions drawn from the above tests, therefore other tests were sought which would give a measure of comparative value. The Brinell test was next tried as follows: a 500-kg. weight on a ball 10 mm. in diameter for a period of 30 seconds was used. The sample was poured into an open steel mold 2 ins. in diameter by $\frac{5}{8}$

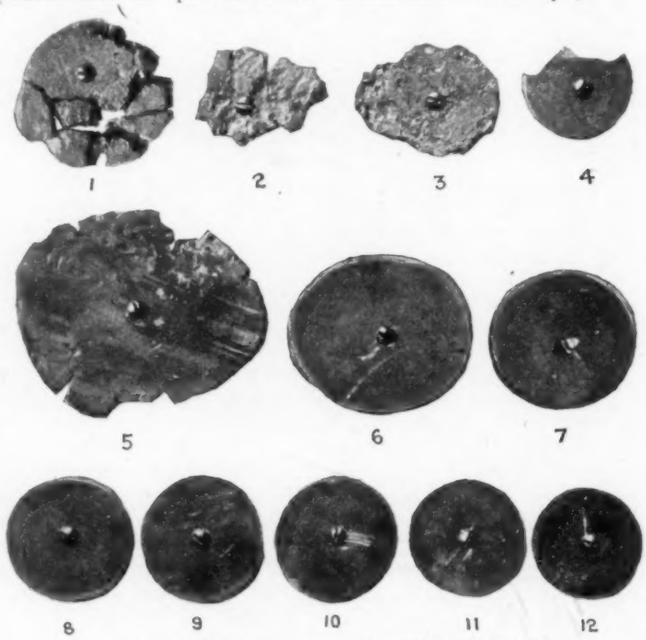

FIG. 4. SHOWING RESULTS OF HAMMER TESTS ON BEARING MIXTURES.

in. deep, previously heated to about 150 degs. C. Before making the impressions the specimens were faced off, removing just enough metal to even up the two flat surfaces. The Brinell test was then made on the bottom end of the specimen at three equally spaced points on a circle one-half the radial distance from the center. An average of the three readings was recorded as the hardness of the metal. A Brinell hardness numeral of 30 for tin-base and 23.5 for lead-base metal was found to give most excellent results, other things being normal; but this test did not reveal the whole story, since it failed to differentiate between toughness and brittleness.

A further test was found to be necessary in order to

detect and study these two characteristics, so a hammer test was devised which has shown results that indicate the qualities of the babbitt more clearly and definitely than any other quick test. The test specimen if soft peens out, if brittle it breaks, while if soft and brittle it peens out and crumbles.

This test resembles the most severe service conditions with the wiping action left out and is introduced here as worthy of the most careful consideration, and the many tests made have proven it to be extremely useful in giving a measure of brittleness and toughness. When used in combination with the Brinell test we have no difficulty in detecting defective babbitt metals.

A series of hammer tests was inaugurated with special reference to the comparative qualities of the lead-base and the tin-base metals. These tests included a great variety of heat treatments and methods of handling the metal and their results emphasized the favorable possibilities of the lead-base metal, but also showed clearly

FIG. 5. A DROP HAMMER BUILT FOR TESTING BABBITT MIXTURES.

that the temperature of both the smelting and pouring of the metal must be kept within narrow limits.

The samples for test were made as follows:

The metal was poured into a metal mold producing a rough casting 1¼ in. in diameter by 5/16 in. thick, which was then turned to 1 in. in diameter by ¼ in. thick. The turned sample was placed on the anvil of the testing device and the hammer set in motion. Readings were taken at frequent intervals, observing thickness of sample and number of strokes, from which curves were plotted.

Samples were taken from the kettles where the different alloys were being smelted, from stock ingots remelted in a hand ladle and from various babbitting pots. A careful record was made of all conditions that might affect later results, including the temperature and general condition of the metal, as well as the temperature of the molds into which they were poured. The results of the tests on these samples demonstrated clearly that some were hard and brittle, some soft and brittle and others soft and plastic, while still others were hard and tough. The tin-base samples showed much less variation than the lead-base although some of the very best results obtained were from the lead-base metal. These observations and tests further indicated that smelting and pouring temperatures especially of the lead-base metal were of prime importance.

The following detail study of the lead-base metal was then made on material known to be of good quality before subjecting it to different temperatures. The results are shown in Figs. 3 and 4. The samples are numbered 1 to 12.

No. 1 was poured at 320 degs. C. Note the granular and brittle condition of the metal due to having been poured too cold.

No. 2 was poured at 700 degs. C. Note the unstable character of this sample due to having been poured too hot.

No. 3 was heated to 700 degs. C., allowed to become cold, then reheated to a similar temperature many times and finally reheated and poured at 460 degs. C. This sample was also unstable due to repeated overheating, even though poured at a proper temperature.

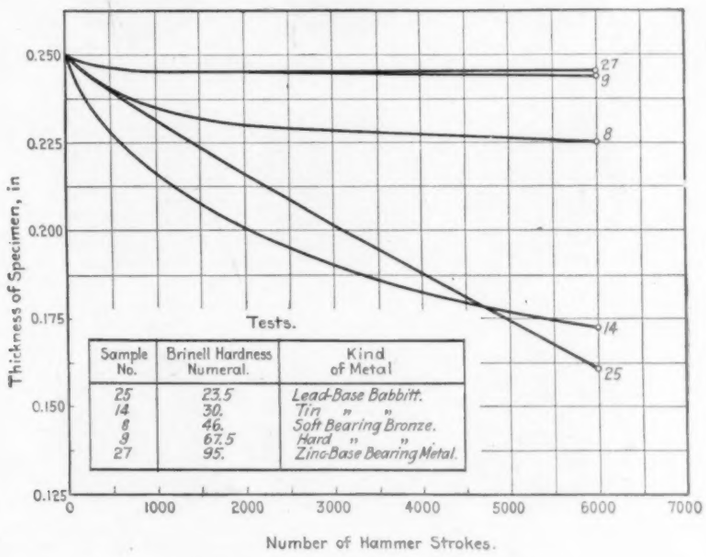

FIG. 6. COMPARATIVE CURVES OF BABBITT AND BRONZE BEARING METALS.

No. 4 was heated to 550 degs. C. and allowed to become cold, then reheated to a similar temperature many times and finally reheated to about 490 degs. C. and poured. Note the brittleness due to repeated overheating, even though the temperature was only slightly higher than that necessary for the pouring of good bearings.

No. 5 was heated to 700 degs. C. and cooled to 400 degs. C. before pouring. Note the softening effect due to the single overheating.

Nos. 6 and 7 were poured at 360 degs. C. Both show a decided improvement over No. 1 but were poured at too low a temperature to produce the proper hardness and toughness necessary for a good bearing.

No. 8 was heated quickly to 600 degs. C. and poured at once. Note that very little damage was done by the one overheating.

No. 9 was heated similarly to 600 degs. C. but cooled to 460 degs. C. before pouring. Note the difference in shape of curves Nos. 8 and 9.

Nos. 10 and 11 were poured at 480 degs. C. and No. 12 was poured at 460 degs. C.; all were hard and tough giving curves characteristic of a good babbitt.

A large number of tests, not here shown, were also

made on babbitts of a great variety of composition for the purpose of comparison. The tin-base babbitt curves were practically all found to be within the limits shown by Nos. 10, 11 and 12 of Figs. 3 and 4. No babbitt tested gave better curves than those made from the lead-base metal when carefully and properly made, thus demonstrating the possibilities of the lead-base metal.

This series of tests was so conclusive as to the importance of temperature limitations that a temperature regulator was designed and installed on each babbitting pot. These regulators were so adjusted and safeguarded as to render it impossible for the temperature of the babbitt in the pot to exceed a fixed limit.

It has been found to be entirely practical to automatically regulate the temperature of the metal in the pot so that the variation from a fixed point need not be more

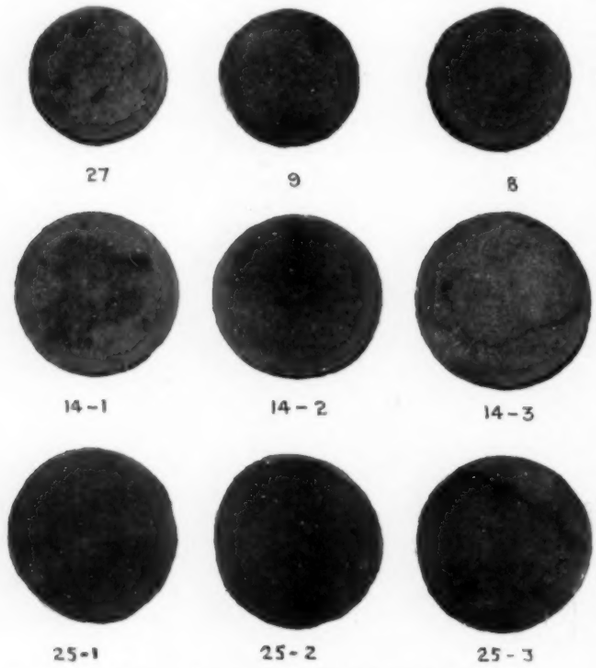

FIG. 7. HAMMER TESTS MADE ON FIVE DIFFERENT BEARING ALLOYS.

than plus or minus 10 degs. C., and this variation is well within the range of safety for the lead-base as well as the tin-base metal.

The hammer testing device on which data for the curves of Fig. 3 were made proved so interesting and instructive that an improved drop-hammer was designed and built. This is shown in Fig. 5. This hammer has a stroke of 1¼ ft. lb., but the anvil is heavy, thus resulting in similar curves to those of Fig. 3, but requiring only about five per cent. of the number of strokes, and a correspondingly shorter length of time for the test than was required on the first device.

All of the more recent tests including the following have been made under the new hammer, and Figs. 6 and 8 are introduced to illustrate characteristic hammer test curves and appearance of test pieces made from five different bearing alloys under normal conditions.

These tests represent a few of a long series of tests made in connection with commercial work with special reference to the following features: Raw material used, smelting and refining in the crucible or kettle, Brinell hardness of standard samples of the ingot as poured, remelting and pouring temperatures at the babbitting pot, temperatures of the shells into which the metal is poured, Brinell tests and hammer tests taken from the babbitting pots at frequent intervals, and to a limited extent the microscopic structure of babbitt known to be good as well as that known to be defective.

The conclusions drawn as a direct result of these tests, together with a large amount of service experience, may be summarized as follows:

1. The number of compositions of babbitt metals should be as few as possible, preferably one of the tin-base and one of the lead-base and each should be made the best of its class.

2. The constituent metals must be of superior grade, carefully tested and inspected, since the first requisite is a good raw material.

3. The alloying or smelting is of vital importance and must be so done that the high and low melting-point metals may be properly alloyed far below the melting point of some of the component parts. A temperature of 500 degs. C. and less has been found to be sufficient to obtain satisfactory alloying of babbitt metal. The melted metal should at all times be kept covered with powdered charcoal or other protection from oxidation.

4. Pouring the babbitt too cold tends to produce a granular or coarse crystal formation and pouring it too hot tends to produce a softening effect. The lead-base babbitt is not nearly as fool-proof as the tin-base, and therefore the range of pouring temperature is more limited. However, a pouring temperature of 460 degs. C. (450 degs to 470 degs. C.) for both lead-base and tin-base babbitts has been found to give most excellent results.

5. Heating the shell from 100 degs. to 150 degs. C. before the babbitt is poured into it tends to prevent blowholes and similar defects and also prevents the lining from shrinking away from the shell.

6. Babbitted bearings must not be jarred while the metal is solidifying since any disturbance at this temperature tends to enlargement of the crystals and corresponding brittleness.

7. The matrix of the lining metal should be just stiff enough to support the hard crystals. These hard crystals should be as numerous as possible and yet not lie on each other to cause brittleness.

8. A Brinell hardness of 23.5 for lead-base and 30 for tin-base babbitts has been found to give most excellent results.

These tests and suggestions are offered simply as a study to be furthered by those interested in applying babbitted bearings to their several service conditions; and while no final decision can be reached as the result of these tests, they certainly do emphasize the great importance of working closely to given compositions, and of following definite processes checked by chemical tests, Brinell tests, hammer tests, careful supervision, and finally by the court of last resort, service.

MOTOR CAR BRONZES.

The American Society of Automobile Engineers has adopted the following specifications for bronzes:

Hard bronze—Copper, 87 to 88 per cent.; tin, 0.5 to 10.5 per cent., and zinc, 1.5 to 2.5 per cent.

Gear bronze—Copper, 88 to 89 per cent.; tin, 11 to 12 per cent., and phosphorus, 0.15 to 0.30 per cent.

The hard bronze is similar to the United States government bronze *G*, which has a tensile strength of approximately 35,000 pounds per square inch. This is to be considered a general utility bronze for severe working conditions where heavy pressure and high speeds obtain and can be employed for light gears, valves, etc. The gear bronze is commonly known as English gear bronze.

COST SYSTEMS

An Article Telling of a Practical Way to Arrive at Costs in Metal Manufacture.

By Mett McCune.

Up to within the last twenty-five years the problem of placing a selling price on an article was a comparatively simple matter. The finished article would be examined from all sides, not so much to determine how much it cost to produce it, but rather to see how large a figure it would stand. Perhaps it might be compared with a similar article and that form the basis for making the price. The difference between the cost of production and the selling price was sufficiently great so as to avoid any possibility of selling goods for less than they cost to manufacture. On the contrary the question was not, are we making money on this, but rather, how much can we make this bring governed only by what the producer thought the prospective purchased would pay for it.

But within the last twenty-five years great changes have taken place in manufacturing lines. The increase in the number of factories, the resulting competition and consequent reduction of prices, has rendered this method of making prices obsolete, and the difference between the cost of making and the price obtained is now often so little that manufacturers feel it to be absolutely necessary to know as nearly as possible the cost to produce an article. This has resulted in the installation in many plants of costly and often times cumbersome cost systems. This is not true in all cases for very many factories have cost systems that are running smoothly and producing results at a moderate cost. The trouble has been that many have thought the cost system to be a panacea for all the ills the factory is heir to and have lost heart when they were dis-illusioned. They have gone into it with great enthusiasm and employed a large force of clerks and scattered their tags and cards broadcast throughout the factory, but the results were not up to their expectations. The system was defective and met with opposition from the workmen and even from the foremen. Then they lost to a degree their enthusiasm and while few have abandoned the idea entirely yet most have adopted a slower but surer method of procedure.

They were simply trying to split a log by trying to drive the broad end of the wedge in first. While I would not say a word against the expert Factory Accountant, for I believe in him and his methods thoroughly if he is what he represents himself to be and I believe the advice and assistance of experts in this, as well as other lines, to be the best and cheapest in the end, yet, I believe a man employed in some capacity in the factory or office should be broken into this line of work and that the Factory Accountant should be employed only to instruct him in his duties and to get the system working. Such a man can generally be found in every factory. It is best to have one who is in touch with the manufacturing end, for familiarity with the various operations is absolutely essential. Therefore an office man is not the ideal one for such a place unless he is in addition to being a bookkeeper, a natural mechanic, and if he were, the chances are he would not be found in the office. So that I would say that in the factory is the place to look for your man.

In the first place, it is necessary to have a receiving and disbursing end. This is generally called the Supply Department. Here the foreman will make their requisitions for raw stock and supplies; the stock clerk in turn watching his stock carefully so as not to get caught without enough goods on hand to fill the foreman's orders, keeping a record of the goods on his shelves and the quantity in the factory. He will, when he finds his stock getting low, order from the Purchasing Agent, allowing him plenty of time to get the goods. He must of course avoid overstocking, consulting with the superintendent if necessary before placing his orders. Having organized our supply department, we next want to learn just how this stock is used in the factory and the cost of the various operations necessary to produce the finished article and place it on the shelves of the stock-room.

It is impossible to get out a set of cards that would suit every case. The needs of the factory should be studied before a form is printed. The advice of the expert will be of value here, but in general, the tags are the same, differing only in detail. The first card we shall require is the Material Report. On this card the cost clerk will find when it is returned to his department, the kind, weight, and gauge of metal given to the workmen by his foreman, also the operation and if a special tool or die is used, its name and number. It would also show the weight and number of pieces finished; the weight of scrap metal and also state whether this is good scrap metal; that is, if it can be used again before remelting. We have been working with sheet metal, of course if you start with the mixing of the metal our raw stock will be ingots, but the idea will be the same and every foreman who uses raw stock should have and use these Material Report cards.

Next we have the cost of the operations to get. I do not believe in having every operator have a bunch of tags and requiring him to make out one every time he finishes a job, but I would have a tag which would be made out by the foreman. On this tag would be the date, and, if necessary, the hour. By this I mean, for example, if it should be a soldering department and the job should be fifty spoonholders, I should write fifty as the quantity, not one hundred and fifty, which would be the quantity if the body and two handles were counted as separate articles. The price, if the work is done by the piece, should be on the tag; if it is made by the day the time spent on the job should be written on the tag by the workman. But as far as possible, piece work should be confined to a certain number of workmen, and if necessary to have some of the work done by the day do not have one man work part of the time piece work and day work the remainder. I think every superintendent and every foreman will understand why this is advisable.

We will say the job given out was a piece-work job and all the information on the tag was written by the foreman or his clerk. This the workman will keep until night or early next morning. At night or the first thing in the morning, if the job has been finished, for most workmen prefer to do it at this time, the operator will make out his tag. His will be a large one with a place on it for the date, department and his name at the top. The space below will be ruled and spaced for places for the quantity, numbers and names of the articles with the price, but he does not extend it; this is left for the time-keeper and his clerks. If the man has more than one job there is room for all to be entered. This, with the smaller tags given him by the foreman, are given back to the foreman and examined and compared to see if the quantities and prices agree. The large tags are sent after examination to the time-keeper's office, and the smaller ones should be kept by the foreman until after the man has been paid, for they are often of value, especially if a mistake is made or a man thinks a mistake has been made in his pay. If a job is not finished the day it is given to the man he will make out his tag just the same,

putting on it the number of the article and the name, but not the quantity and price, and will simply write on the tag, "working on above article."

If the price for this operation is a new one just made by the foreman or agreed upon by him and the workman, he should make a record of it for himself and file it away. I want to say that there is nothing better than a cabinet with cards for this. Books, loose-leaf or otherwise, are not as convenient, and I would not recommend their use. He then makes out a price tag which has on it the number of the article, the operation and the price. This is sent to the superintendent's office for his inspection and approval. He may keep a set of records for his use, and I should consider it advisable for him to do so. If he considers the prices to be right he sends it to the time-keeper's office, who makes a record for his use and which he uses for comparison when the workman's tag reaches him.

The price tag now goes to the cost department, where the final record is made. We will now take up the matter from the office of the cost department. When the first operation on a new job is completed a time ticket will be made out by the operator, showing name, number and rate, if a piece job, or if it is a day job the time spent, showing time and rate per hour of the workman; his name and the date the job was started and finished will also show on this ticket.

If the cost clerk had not been notified that this job had been started, he now knows from the time tickets that the articles are in processof manufacture, and he starts a cost card for this job, and as the article goes through the various departments, the tickets, either piece or day, come to his office and from these he makes his records.

But just a word in regard to day time tags after the time-keeper has made his records from them; they are sent to the cost department, and the cost of the operation is figured from them. It is well to verify these day prices whenever more of the same goods go through the factory, and also would say I am greatly in favor of using the time board for the day time for the use of the time-keeper, foreman and the workmen. It enables the workman to see that his time is right and should be placed where it may be seen by him at any time during the work. The day work tags will then be of value only to the cost department. When the article is finished and sent to the stock room the cost clerk should secure one, and here is where his knowledge of the various operations will be of value; he should go over it carefully, see if he has a record of all the operations; if he has not, or is in doubt, let him consult with the superintendent, and let me say I believe there is no better place than in or next to the superintendent's office for the cost department to be located.

The matter of applying the overhead charges, and the amount is something every manufacturer must work out for himself. When installing a cost system it is well to go slowly, feel your way; opposition will be met with at every step; the men will be suspicious and feel that it is intended wholly and solely to injure them, and until they learn to the contrary will hinder in every way its progress, but this is because they do not understand the object of the system. The manufacturer has at least two objects in view in installing a cost system, the first is that he may have a sound basis on which to make his selling price, the second is to determine whether under constantly changing conditions he is justified in continuing the manufacture of the articles in question. If he finds that he is not producing his goods sufficiently cheap to meet the prices of his competitors he puts it up to his superintendent to find a less expensive method if this is possible. He either drops the article entirely or instructs his salesmen not to force its sale. In my experience of nearly twenty years in various factories I have yet to learn of a single case where the cost system has injured in any way a single workman, and I can say this after having worked in various factories as a workman, foreman and in a cost department; on the contrary, I believe it works to his advantage.

The manufacturer has not got to wait until the yearly inventory to learn whether the year's business has been one of profit or loss. It keeps him from continuing the manufacture of goods at a loss or, at best, at very little profit, and enables him to make prices which sell goods where his competitor, working in the dark, loses track because his prices are too high. Personally, I would rather work for a company making money and would feel it my duty even if I were, to consider it wholly from a selfish standpoint, to aid my employer to secure all the information he desired.

I believe my services to be worth more money, and I believe I would be more apt to get what I wanted from such a one than if I was working for a company that was struggling to make their receipts equal their expenditures. Furthermore, I should feel that, if my employers were on the ragged edge of bankruptcy, it was my privilege and duty to my family to protect myself by looking for another position. The cost system is here to stay, and in time the manufacturer will learn that it is not a cure-all, that his clerks in that department are not infallible and will sometimes get the decimal point in the wrong place, especially if they do not know, as many do not, whether an operation should cost ten cents or ten dollars per thousand, and the intelligent workman will learn that it is working him no harm, but that its results are beneficial.

MAGNALIUM.

In a paper read recently before the Society of Automobile Engineers, Mr. Morris Machol gives some interesting data on the aluminum and magnesium alloy known as "magnalium," and describes the successful use of this alloy for the cylinders and pistons of gasoline engines, particularly where weight is an important factor, as in aeroplane work. The specific gravity of magnalium is 2.5, that of pure aluminum 2.56, and of aluminum alloy No. 12, 2.82, while cast iron has a specific gravity of 7.5. Cast iron pistons show a tensile strength of between eighteen thousand and twenty thousand pounds per square inch, while magnalium shows a strength of twenty-three thousand pounds per square inch. It is also very tough, whereas cast iron is rather brittle. Magnalium is an excellent bearing metal, showing at 280 revolutions per minute and 250 pounds per square inch, a coefficient of friction of 0.0056 as against 0.0075 of babbitt and 0.0069 of phosphor bronze. With a pressure of 400 pounds per square inch and the same speed, the coefficient of friction of bronze is 0.0096 as against 0.0066 of magnalium. One of the advantages of magnalium pistons is the remarkable reduction of vibration. The melting point of magnalium is 1,256 degs. F. at atmospheric pressure, which is less than the temperature often attained in the cylinder. But the magnalium pistons do not get as hot as iron pistons for the reason that the thermo-conductivity of magnalium is fourteen times as great as that of iron. An engine with magnalium pistons is less liable to preignition than one with iron pistons.

U. S. PRODUCTION OF ALUMINUM.

The United States Geological Survey reports that 65,000,000 pounds of aluminum produced in the United States was used in this country in 1912 as compared with 46,125,000 pounds in 1911.

THE SILVER SOLUTION

An Exhaustive Article Dealing with the Deposition of Silver.

By S. Shoeld,* Ch. E., and G. B. Hogaboom.†

(Concluded from February.)

The ability to obtain fairly good results from a silver solution of almost any strength, in regard to the metal or cyanide content, makes it needless to give any definite rules to govern the deposition of the metal. The plater should use the solution that gives the best results on the class of work that he is required to plate, study the conditions with which he is confronted and make every effort to reach the highest point of efficiency.

G. B. HOGABOOM.

S. SHOELD.

The simplicity of the construction of the silver solution requires the study of only three conditions — the metal content, the amount of free cyanide, and the pressure and current density that is necessary. As stated, the first two essentials are governed by the existing conditions. The electrical side is the most misunderstood, and from papers recently published, with subsequent criticisms, in The Metal Industry, there is a division of opinion as to whether it is more important to be governed by the reading of the voltmeter or of the ammeter. While this question does not bear directly on the solution itself and may be a digression from the title subject, the successful operation of the silver solution depends upon an intimate knowledge of both the current density and its relation to the actual conditions found in the operation of a plating solution. The silver solution is an excellent barometer for the study of this question as the slightest change in either the pressure or the current density is readily reflected by either the anode or the cathode.

The position to be taken is that the voltmeter is more necessary than the ammeter in the plating room if only one instrument is available. While the argument will deal directly with the silver solution, the principles are applicable to all plating solutions.

The rate of deposition of metal from a plating solution is directly proportional to the amperage to each square inch of cathode surface. The amperage is always directly proportional to the voltage and inversely proportional to the resistance. If, therefore, the voltage is increased the amperage will increase at the same time and vice versa, that is, if the resistance under both conditions is the same—the resistance of a plating solution being dependent upon the size of the electrodes and the distance between them.

If the ammeter is used alone it would be necesssary to carefully estimate the square inch surface of the cathode and calculate the number of amperes that would be necessary to deposit a given amount of metal in a certain length of time, which would be directly proportional to the gross square inch cathode surface. This calculation is not always possible, and at times a physical impossibility; for instance, if the square inch surface of 50 pounds of wood screws was wanted so that the ampere reading could be had and a definite amount of metal could be deposited. To do this would require the services of a corps of expert lightning calculators so that there would be no delay in changing the work in the bath. These calculators are at present unknown in the plating room and therefore the plater must be satisfied with guessing the amount of cathode surface and consequently the correct amperage to be employed. It will be endeavored to prove the argument by simple algebraic equations. Let A = amperage; V = voltage; a = anode surface; c = cathode surface. Then the current density to be used would be A/c.

If there was an error in the estimation of the cathode surface, say, for instance, that c was estimated to be half as large as it really was, then the current density would be 2A/c, or twice as great as it should be. There being no voltmeter the error could not be corrected. If a voltmeter alone was used and a mistake was made in estimating the cathode surface the error would not be so great. The anode and the cathode rods of a plating tank are generally stationary and therefore the distance between the anode and the cathode is relatively constant. The anode surface is seldom changed to meet any difference of cathode surface. The tank is generally run to its fullest capacity and therefore the anode and the cathode surface are approximately equal. The resistance then would be about uniform in the several batches that are plated, and quite constant. The resistance in this case would be then directly proportional to $\frac{a + c}{2}$. The amperage would be $A = \frac{2\ V}{a + c}$; and the current density $A/c = \frac{2\ V}{(a + c)\ c}$.

If as before the cathode surface c was estimated to be half as large as it really was the resistance would be then directly proportional to $\frac{a + c/2}{2}$, and the current density be $A/c = \frac{4\ V}{(2\ a + c)\ c}$. The anode and the cathode

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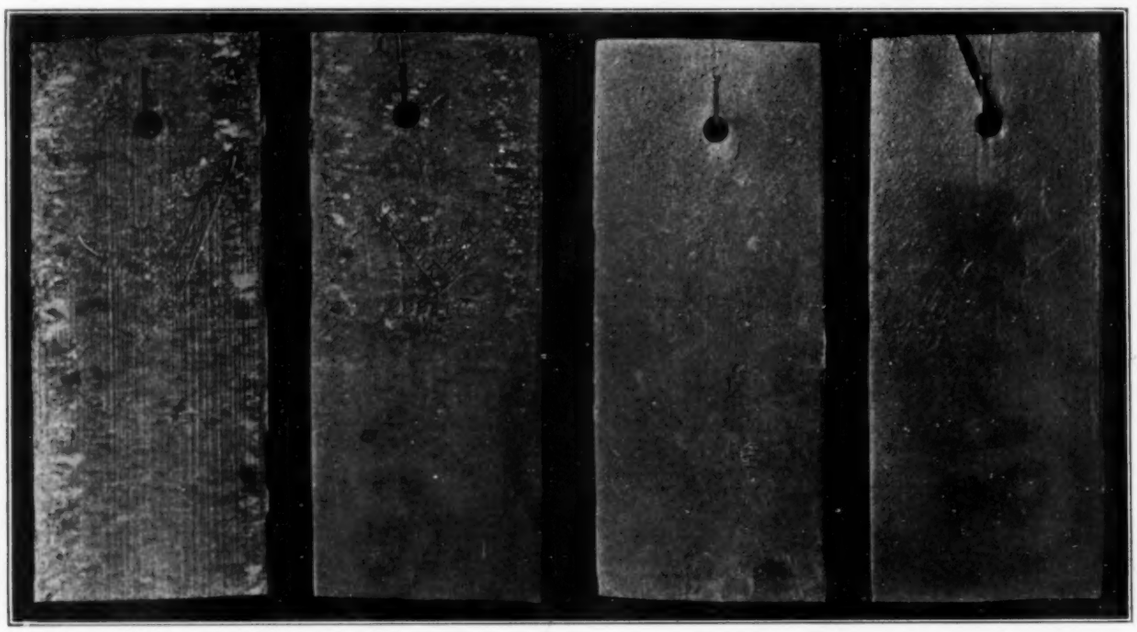
surface being the same, that is, $a/c = I$, and the current density was supposed to be $A/c = \frac{V}{c^2}$ and through an incorrect estimation in reality was $A/c = 1\frac{1}{3}\frac{V}{c^2}$, that is, ⅓ more than intended.

If then when the reading of the voltmeter was used alone the error would cause only one-third more current density to be used in case the incorrect estimation of the amount of cathode surface was made; and by using the ammeter alone, the amount of current density would be twice as large as it should have been. It can be easily seen that if only one instrument is available that the voltmeter is the one to be chosen. Aside from this advantage there is the convenience of the use of the voltmeter. When an ammeter is used it is necessary to calculate the reading with every batch of work while with a voltmeter the reading would be always the same. The current density used on a silver plating is generally two amperes to each square foot of cathode surface. The pressure depends upon the condition of the bath as to the metal and the cyanide content, temperature and the distance between the electrodes; but in a good working solution the pressure should be about one volt.

Another thing to be considered is that there is a certain pressure for every plating solution and to go above or below a given rate in a well balanced solution the results are reflected in the character of the deposit. Too low a pressure in a silver solution gives a coarse crystalline structure to the deposit which will be non-adherent, while too high a pressure will "burn" the work or make it streaky and hard to burnish. A smooth deposit with a good structure can only be obtained when the proper pressure is used.

The reduction of the anode depends also upon the pressure used. The metal content of the solution should be kept constant by the anode. This can be accomplished by using a pressure that will reduce the metal of the anode to such a state that it will feed the solution at the same rate the metal is deposited. If the voltage is too low the anode will be passive and the solution will become impoverished, if it is too high the amount of free cyanide will be reduced and if this is done too often the metal content will be increased above the normal content. The cyanide will also be more rapidly decomposed and additions will have to be made more frequently and the density of the solution will materially increase.

The accompanying photographs show very plainly the effect of different pressures upon the anode. To obtain No. 1 the pressure of .5 volt was used. The coarse crystalline appearance is on the surface only and if the anode is scratch-brushed it will disappear. This would tend to prove that the pressure used was responsible for the crystalline appearance. With such an anode the solution is not replenished with metal and the deposit on the cathode is very coarse in structure. The anode is in a passive state and is not performing its work properly. The pressure was increased to .75 volt and No. 2 was the result. A smooth gray coating can be seen at the bottom of the anode which will increase as the pressure is increased to one volt as can be seen on No. 3. The film of gray will disappear when the current is turned off and the anode have a smooth white surface. The structure of the deposit will be very fine and have a pearly white color, it will be easy to burnish and will take a very high color. The anode being in a perfect active state will replenish the bath with metal without any undue loss of free cyanide.



No. 1. 0.5 Volts. No. 2. 0.75 Volt. No. 3. 1.0 Volt. No. 4. 3.0 Volts.

SILVER ANODES SHOWING THE RESULTS OF VARYING VOLTAGES.

To use too high a pressure would be to invite unnecessary trouble. If the solution was made from the chloride of silver the chlorine would be released at the anode and decompose the supporting wire or hook, or, if the cyanide of silver was used the oxygen released would do the same. It will be noticed that the supporting wire on No. 4, which is iron, is corroded. This anode was run at a pressure of 3 volts. The coating is very dark and is non-adherent to the anode, and a slight touch will cause it to be released and become suspended in the solution and settle on the work causing a rough deposit. The film contains enough peroxide of silver to darken it and to

prevent the free passage of the current. If the pressure is increased more of the coating will result which will fall off in thin sheet-like flakes, immediately another film will be formed and then when a certain thickness will fall off, it will keep doing this until the pressure is decreased. Under this condition the amount of free cyanide is rapidly reduced and the conductivity of the solution decreased.

If the condition of the silver bath is to be kept constant watch the effect of the voltage upon the anodes. They readily tell what is needed and if all other conditions are the same as usual they seldom fail to correctly indicate the trouble. With too little free cyanide the resistance of the solution is increased which would give a corresponding lower voltage. The anode would have the same appearance as that of No. 1. The deposit would be the same and would be of a dull earthy color. If too great amount of free cyanide is used the anodes will remain bright during the deposition and very little metal will be deposited.

These conditions, of course, can only be had in solutions that are being properly conducted. The distance between the anode and the cathode should not be too small; the work should not be crowded in the tank with only a few inches between the electrodes. The anode surface should not be as large as possible but in proportion to the work that is being plated. The anodes should be fully covered with the solution and iron wires or hooks should be used. Sometimes a cloth or wire screen is placed between the anode and the cathode. This will keep the impurities of the anode from being deposited on the cathode and also acts as a resistance to the ions, which would tend to more evenly distribute the deposit, especially when such work as hollow ware is being plated.

The addition of any chemical to age the solution is not to be recommended. Just why an old solution works better than a new one is a problem that has not been solved. It may be due to the formation of a formate and of ammonia which is the decomposition which gradually takes place in a solution.

SHEET BRONZE FOR SAFETY CHAINS AND THE LIKE

SOME VALUABLE INFORMATION RELATING TO COPPER-TIN ALLOYS AND THEIR APPLICATION.

BY ROBERT GRIMSHAW.

As is well known, large quantities of sheet bronze are used for the manufacture of so-called "safety chains," made up of narrow closed links bent double and passed through each other so that the chain may be taken apart only link by link, and only by commencing at one end thereof. These chains are made by special automatic machines, and the fact that they do not break makes them specially sought after for suspending heavy lamps and the like. They do not let go until the tensile strength of the metal is exceeded. They are also used to open and close heavy high-up swinging windows.

Of course, any sort almost of material could be used for such chains, but as a matter of fact they are in general made of an exceedingly tough alloy which has not the tendency of ordinary brass to crystallize. Copper is too soft; although it does not crystallize, in such cases it is out of the question; and where any degree of strength is called for, some sort of bronze seems to offer the only solution of the problem.

In order that a bronze alloy may serve this purpose, it must have at least these three good qualities: a high limit of elasticity, absence of a tendency to crystallize, and sufficient malleability to enable it to be rolled into sheets.

These qualities, and the alloys which possess them in various degrees, are treated in considerable detail by the "Deutsche Metall Industrie Zeitung."

The high elastic limit is an essential point. In comparison with this, tensile strength is unimportant, if there is no accompanying high elastic limit. This, of course, prevents permanent stretching under heavy loads. A metal with a high elastic limit will not commence to stretch until its limit of tensile strength is about reached. Experience shows that a bronze sheet, to possess a high elastic limit, must be rolled from bars which also have this quality in high degree. It is not sufficient to take a soft metal and roll it until it has a high tensile strength, for the product would have a low elastic limit. To be certain in this matter, the metal must be rolled hard.

There are two metals which impart to copper, in alloy therewith, a high elastic limit: tin and iron; and the best bronze which is used for the manufacture of safety chains contains both these metals. At present, says our authority, there are but two alloys in the market which are thoroughly suited to such manufacturing purposes. One contains nothing but copper and tin; the other, copper, tin, zinc and iron. Both have a high elastic limit. The mixture which consists of copper and tin is difficult to roll. It is somewhat hard, but not malleable enough to permit rolling. It is one of the alloys which only a few works are able to roll with success; most of them will not risk injury to their machinery.

Although a copper-tin alloy with tin up to ten per cent. can be rolled into sheet, the best mixture for this purpose contains only eight per cent.; and this we will here name Alloy A. This is a bronze of great tensile strength. It is difficult to roll, and then only by means of repeated annealing.

An analysis of the alloy used in the safety chains shows copper 92.06, tin 7.93, iron 0.01 per cent. Another "chain" bronze consists of copper 91, tin 5.25, iron 2, zinc 2; and this we will name Alloy B.

In making this latter alloy, the best wrought iron is used. The presence of tin and iron gives very satisfactory results. The alloy is composed of copper 90.57, tin 5.25, iron 2, zinc 2.18.

Many manufacturers of safety chains maintain that the employment of zinc causes crystallization, whereas with Alloy B, containing both iron and tin, this is certainly not so.

The fact that a high elastic limit is necessary for a chain bronze that shall be free from objections is proved by the following results obtained with analyses of inferior chain bronzes. Although hard enough to be rolled, they are too soft to use in chains:

Copper	92.55	93.26
Tin	5.11	4.76
Zinc	2.34	1.98

These bronzes had too low an elastic limit, and stretched under a load which would not have affected a better alloy.

In making sheet for chain making, it is customary to cast the bars of the width of the desired sheets, and not to cut them narrower after rolling.

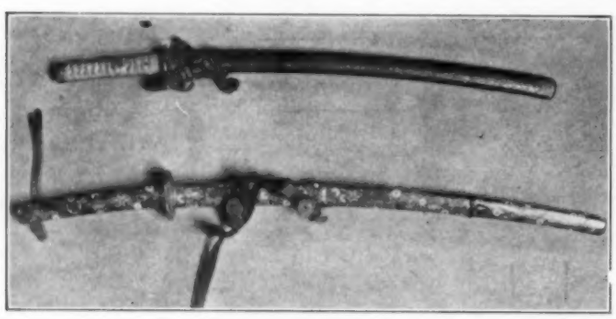
THE MANUFACTURE OF JAPANESE SWORDS, WITH REFERENCES TO THE SWORDS OF OTHER COUNTRIES.

A Description of the Manufacture of these Articles of Offense and Defence in the Far East.

By R. I. Geare.*

The best authorities seem to agree that the Japanese sword was evolved out of an Indo-Persian type of weapon, while the famous Katana, or one-edged sword, was first forged in the seventh century by dividing the old two-edged Chinese sword. The oldest Japanese swords were made of bronze. They apparently followed a classical Grecian model described as "leaf-shape with central ridge." Following the bronze era came the iron age, during which only single-edged swords were produced, without any curve, and sometimes provided with a ring cast on the end of the handle. This was in use as the soldier's sword up to the sixth century. Later, with the introduction of Buddhism, came the double-edged sword (Ken or Tsuru), which, however, was never in universal use. In the seventh century an improved form of the iron single-edged blade was adopted.

The long sword of the Japanese is two and a half to three feet in length, with a heavily backed blade, a sharp cutting edge, a long handle, and a small round guard. The short sword is about half as long. In older times both were worn by the Samurai, a privileged fighting class, corresponding to the knights of the Middle Ages,



Photos, courtesy of Metropolitan Museum of Art, New York.

Fig. 1. Two ceremonial swords of Japan, in scabbards, the one on the bottom being richly ornamented and lacquered.

and the combination was called "dai-sho." The short sword was used for committing hari-kari, and the right to use it for this purpose was granted to the Samurai, to save them from the disgrace of being publicly executed. The scabbards, made of lacquered wood and highly ornamented, were thrust into the girdle where they were fastened by cords of plaited silk. This number was sometimes increased to four or five on going into battle, and in addition a dagger was often concealed in the bosom. But only military men could wear two or more swords. Any one could, if traveling, carry a short sword, but this type of weapon was not used in warfare. The Japanese military sword, the curve of which is about the same as in the present regulation United States sword, conforms to a great extent with the sword of the German infantry officer, although it is shorter. The Japanese naval sword is an extremely short weapon, and might easily be taken for a long knife.

That the sword has exercised a powerful influence on the Japanese nation cannot be doubted. An eminent writer says that the distinction of wearing it, the rights which it conferred, the deeds wrought with it, the fame attaching to special skill in its use, the extraordinary value set upon a fine blade, the honors bestowed on an expert sword-smith, the household traditions that have grown up about celebrated weapons, the profound study required before one could be a competent judge of a sword's qualities—all these considerations combined to give it an importance far beyond the limits of ordinary conception. So highly, indeed, was the sword-maker's art rated in Japan that one of the emperors (1186 A. D.) deemed sword-making to be an occupation worthy of a sovereign. The Japanese have always surrounded their swords with certain superstitions. They were believed to be capable of bringing their owners, writes one authority, either good fortune, revenue, wealth, virtue, longevity, reputation, sickness or poverty.

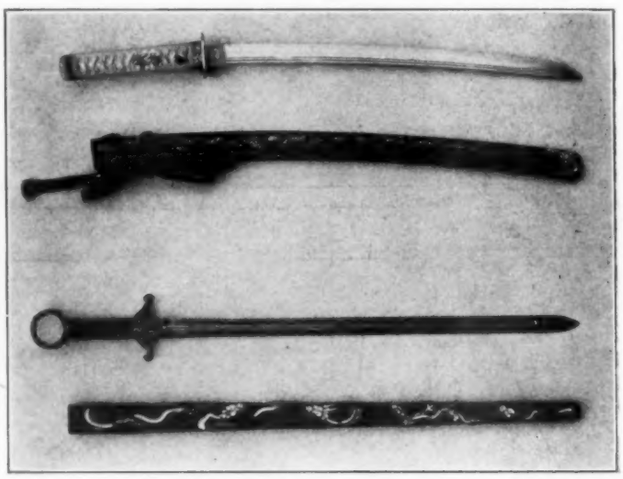


Fig. 2. Upper—A bronze military sword of Japan, with lacquered scabbard. Lower—Steel military sword of Japan, with lacquered scabbard.

The earliest swords on record were those of the Assyrians, the Greeks and the Gauls. They were double-edged, straight or leaf-shaped, and were made of bronze. Later came the Roman swords, made of hardened copper. These were stout, straight and double-edged, with point forming an obtuse angle. During the Middle Ages swords were made longer, and cross-pieces (guillons) were added for the protection of the hand. Mounted soldiers often carried a narrow-bladed sword, called "estoc," attached to the saddle, and they also wore the heavy sword as well. Knights wore at their right side a misericorde, or "dagger of mercy," which they used for despatching their fallen foes.

In Germany a two-handed, heavy sword, about six feet long, was used by the "Lansquenets," or foot soldiers. This sword might almost be called the national weapon of the Swiss, up to the time of the introduction of fire-arms. In the sixteenth century swords were made much lighter, in consequence of the discarding of armor upon the invention of gun-powder. The rapier was then introduced as a military sword, the point of which, rather than the edge, was used in attacking. About that time was in-

*National Museum, Washington, D. C.

troduced the custom of wearing a dagger. Later, when the art of fencing was more widely known, all secondary protections were discarded, and the rapier became a weapon of offense and defense. The best rapiers were made in Toledo, which was noted for its excellent blades.

About the beginning of the eighteenth century the rapier was to a great extent replaced by the "colichemarde," a duelling sword, the blade of which was wide for about half its length and narrow for the remainder. After a comparatively brief existence this weapon gave way to the small sword, with circular guard, and a narrow straight blade. The sabre, the best known form of broad-sword, is single-edged. Its blade is thick at the back, becoming thinner towards the edge. A light form of sabre, known as the scimitar, is the favorite weapon of the East, while the cutlass, which is really a short, heavy broad-sword, is used in most of the navies of the world. To this group belongs the machete, commonly used in Cuba, while the claymore of Scotland is a heavy, straight broad-sword, with an elaborate basket-hilt.

Apart from the sword blade, the Japanese in olden times placed special value on the "guard," or tsuba, which was the most important accessory of the sword, and upon its embellishment the armorer, engraver and the goldsmith expended their best efforts. This "guard" consists of a disk of metal, usually bronze or silver, which was not soldered to the steel but was merely slipped over the blade and made fast to the hilt, the latter having one or more oval apertures through which the side-arms were thrust. The sword occupied the place of honor in the middle slot, and on one or both sides was the *Ko-dzuka*, a small sharp-pointed knife whose blade reposed in an outer furrow of the scabbard. The artificers in metals devoted their best talents to the elaboration of the sword-guard, and the most renowned artists originated the designs. About the beginning of the eighteenth century soft alloys, composed of variously colored metals, came into use for the manufacture of sword-guards. Two of these, *shakudo* and *shibouitshi*, are frequently alluded to by Japanese writers. The former is a gold bronze; the other, a silver bronze; but in each of these alloys the proportions of the metals used varied according to the color the artist wished to obtain.

These old bronze sword-guards rivaled the painter's palette in variety and beauty of color. Iron had not been altogether abandoned, but it was used in conjunction with the bronze, producing ruddy and golden effects as well as rich greens and electric blues. Translucent enamels, with their jewel-like glints of color, were also profusely used. The Japanese metal worker could not have produced such superb effects in his sword-guards without a detailed knowledge of methods of corrosion and oxidation. Sometimes as many as seven metals were combined in one example, the tones being so exquisitely blended as to present a veritable poem in color.

Thus the sword-guard, it will be seen, is the most important piece in the decoration of the sword. As for the designs employed, they were chiefly portrayals of animals and plants, as well as delineations of religious and mythical themes. The armorial bearings of a family or clan were often marked out on the sword-guard, and the chrysanthemum ornamented the guards on the emperor's swords. Sometimes grotesque forms were employed, and interlaced serpents biting a lance was one of the favorite reproductions.

One of the most ancient Japanese workers of sword-guards was Kanaiye, who lived at the end of the fourteenth century. He used red and yellow bronzes, in conjunction with gold and silver, in incrustations, and after the manner of cloisonné, with very rich effect.

SOFT SOLDER

By Robert Grimshaw.

Soft solder and rapid solders have been known for a long time and find very general application. They should properly contain only tin and lead; but there are in the market many kinds, which contain bismuth, codmium and zinc; these latter, however, are usually for special purposes only, and their employment is not very extended. According to a writer in the Deutsche Metall-Industrie-Zeitung, antimony is often present, but only as an impurity.

There are in the market three proper varieties of soft solder. The first contains two parts by weight of tin and one of lead; the most usual mixture is, however, the second—one part of each of the two metals. The third sort contains two parts of lead to only one of tin. This latter is used by the lead worker for lead pipes; as the other two alloys cannot be employed for this purpose, getting hard too soon, and not being sufficiently plastic. The plastic condition is due to the formation of two separate alloys in cooling; one of these soon becoming hard while the other remains longer liquid. There remains, thus, a great number of fine grains bedded in a liquid mass, making a paste. Naturally, where all the material is either firm or liquid, there can be no pasty state.

The best soft solders are made from pure new tin and pure new lead; the employment of scrap is, however, very general. This is the reason that so much antimony is found in solder. It is really hard to find in the market solder that does not contain from 2 to 5 per cent. of this metal. Its presence improves the appearance of the solder; one made from scrap, with this metal as a mixture, looks better than any one of new material without it; so that those who think that they can judge solder by the appearance are in error. Antimony makes the solder less liquid when melted, and increases the difficulty of its adherence to the surface to be joined. Solder containing antimony has also a greater tendency to injure the surface with which it is in contact, and does not stick to the soldering tool so well as pure solder. So in all we must consider the presence of antimony as undesirable.

Bismuth is purposely added to solder to lower its melting point. A very small quantity thereof has quite a marked influence; but its price is so high that its employment for this purpose is very limited.

Zinc, even when only in small quantities (as for instance a few hundredths of 1 per cent.) has a very undesirable effect on the solder, lessening its good qualities and injuring its appearance. Solder containing zinc flows slowly and leaves a "tail." This metal may be removed from the solder by putting a stick of green wood at the bottom of the melting-kettle and letting it boil out. Aluminum has about the same effect as zinc, and decreases the fluidity of the solder; and when there is much therein it will not adhere to metal.

The use of phosphorus in solder has been much discussed. When in considerable amount it has an undesirable influence, there being a tendency to form small pellets and to run from the surfaces to be joined; also, it attacks the soldering iron. The presence of a small quantity of phosphorus in solder which has got this is, however, of advantage, as it makes it more fluid; but the quantity must not exceed more than a few thousandths of 1 per cent., and it is best added in the form of phosphor tin. Twenty-eight parts of phosphor tin to 45,000 of solder are enough; and it must only be added when the solder has become thick.

EDITORIAL

OLD SERIES. Vol. 19. No. 7. NEW YORK, JULY, 1913. NEW SERIES. Vol. 11. No. 7.

THE METAL INDUSTRY

With Which are Incorporated
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THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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CONTENTS

	PAGE.
Manufacture of Large Manganese Bronze Castings	287
The Back of the Shop	289
The Proper Care of Machines and Tools in the Manufacture of Brass and Metal Goods	290
Dip Process for Matting Aluminum	292
The Electrodeposition of Nickel (Continued)	293
A Study of Bearing Metals and Methods of Testing	295
Cost Systems	299
The Silver Solution (Concluded)	301
Sheet Bronze for Safety Chains and the Like	303
The Manufacture of Japanese Swords, With Reference to Swords of Other Countries	304
Soft Solder	305
Editorial:	
Standard Specifications	306
Correspondence:	
Bearing Metals	307
Silver: Its Extraction, Structure and Novelty	308
Extinguishing Fires With Saw Dust	308
New Books:	
Electro-Plating and Electro-Refining	308
Metallic Alloys	308
Shop Problems	309
Patents	311
Equipment:	
Notable Core Oven Installation	313
Emrich Drill Chuck	313
Standard Roto Plater	314
New Gasoline Brazier	314
Progress of Electrochroma	314
Aluminum Shoes	315
Bronze Journal Bearings	315
Polishing and Grinding Heads	315
New Double Acting Press	316
Spray Lacquering Small Articles in the Tumbling Barrel	316
Polishing Hood	316
Associations and Societies	317
Personals	318
Trade News	319
Metal Market Review	326
Metal Prices	327

STANDARD SPECIFICATIONS

The report of Committee B-2 on metals and alloys presented at the sixteenth annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J., June 24-28, 1913, is interesting because of the thoroughness with which the sub-committee 1 on pure metals in ingot form has gone into the subject of copper. The committee presented two specifications to the society for consideration and adoption. These specifications which were ordered by the society to letter ballot covered the following:

"(a) For Lake copper wire bars, cakes, slabs, billets, ingots, and ingot bars;

"(b) For Electrolytic copper wire bars, cakes, slabs, billets, ingots, and ingot bars."

The American copper production has been classified after a careful consideration of the present trade conditions into (a) Electrolytic, (b) Lake, and (c) Casting. After Electrolytic and Lake copper had been disposed of the sub-committee reported that there are three sources of more or less impure copper which are marketed as "casting." These include re-refined copper from virgin sources, copper electrolytically-produced by deposition from impure liquors, and copper reclaimed from secondary sources. Virgin casting copper constitutes copper with a high copper percentage of 99.80 or over, and a resistivity too high for modern electrical requirements and small quantities of impurities more or less innocuous.

The report states that the second source of casting copper, electrolytic precipitation from impure liquors, is very irregular. It says:

"In electrolytic refining, a certain proportion of the output, varying from nothing to 2 per cent., has to be recovered by use of insoluble anodes, due to chemical solution of part of the copper as distinguished from electrochemical solution. As copper electrolytes invariably carry arsenic and other impurities, a contaminated cathode is produced on account of the high working voltage—two volts or over—of such a tank. At one time this material was made into casting copper, but as it was difficult to market on account of the quantity and grade—copper varying from 97.5 to 99.5 per cent.—it has largely been suppressed, by refining, crystallization as bluestone, or in any other way."

Regarding the third source of casting copper the report says:

"The third source of casting copper—reclaimed copper—is large in quantity. In quality it is generally an alloy carrying tin and nickel as the main impurities and of no fixed composition. An ordinary average would be about 99.25 per cent. copper, but 98.5 per cent. would not be unusual. The impurities, however, may be a distinct advantage in foundry work, as a little tin generally improves the properties of the castings. The source of this product is mainly miscellaneous copper-bearing material derived from the manufacture of brass and bronze. This is usually collected by junk men and sold to the refiners, who largely eliminate the zinc, lead and iron which such waste carries.

"The clean brass and copper scrap from large mills working these metals do not find their way into this secondary trade, as

they are readily worked up into material by the original melters. There are many small smelters and a few large ones dealing in this miscellaneous foul scrap and their output is so variable that any comprehensive specification seems impossible. The larger concerns have brands which they protect by maintaining their individual characteristics reasonably constant, however much the particular brands may differ among themselves.

SUMMARY.

"Summarizing, about all that can be said of casting copper today is that it is not reasonable to expect either low resistivity or any considerable ductility from such material; as its name implies it is exclusively a foundry copper. The copper contents are very variable; better known brands run in general over 99 per cent. and in some cases of virgin copper an assay of 99.9 per cent. is regularly maintained. As long as the copper is clean, free from slag or dirt, and shows good fluidity when melted, but little objection can be made to the particular impurities which may be present.

"From what has been said, it will be seen that it is impossible to draw up a specification which can be acceptable at the same time to all of even the larger producers and consumers of what is nevertheless a distinct class of American copper. If the consumer is interested in getting certain results possibly connected with the particular impurities present, he should familarize himself with the assay of the brands with which he has had success and insist upon uniform delivery. If he is buying casting copper at a price far below electrolytic, he must realize that the copper contents must be low or it would have paid the producer to have had the copper electrolytically refined. A great deal of the consumption is by small brass foundries where testing facilities are very limited, and, consequently, specifications are not likely to be given serious attention."

The question of arsenical copper brought up by foreign criticism was thoroughly discussed, and the subcommittee felt that the ground was covered by the above report, which was endorsed by the whole Committee B-2.

The gist of the sub-committee's work is contained in the summary as given above, and about expresses the sentiments entertained by metallurgists regarding the copper situation before the appointment of Committee B-2. The sub-committee is to be congratulated upon the clever way in which it has handled a difficult subject and for the sensible conclusions arrived at. It is to be hoped that the two specifications as proposed will be adopted and will prove acceptable in the cases where they apply. Copies of the proposed specifications may be obtained from Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

BEARING METALS

To the Editor of the Metal Industry:

Having read with much interest the article in your June number by Mr. A. P. Wright on the subject of Bearing Metal, I am asking equal space in your valuable publication to take issue with your contributor in some instances where I think "Wright is wrong." I first want to compliment you for having your pages open to practical men for giving their knowledge and experience along mechanical lines, for it is to the ambitious American mechanics we owe most for the inventions and developments that have revolutionized the world's work with tools and machinery.

I do not want to quarrel with Mr. Wright, but feel it a duty to correct some of his statements, having myself been in the bearing metal game for twenty years, deeply interested with investigation, experiments, practice and production, together with some practical experience covering generally every class of machinery and finally getting down to the productive end to make and market a product evolved from such experiences.

In the end and after all it is simply a question of the best material for reducing friction in the bearings, "the vital parts of all machinery." I have been in the game long enough to know that many millions of dollars have been wasted on the false theory that the highest priced metals were necessarily the best for machinery bearings. This comes from the fact that tin is the aristocrat while lead is the plebeian in the soft metal family. Any intelligent man who ever wore a pair of overalls and decorated his nose with machine grease knows that lead, common every day pig lead, is the best anti-friction metal planted in the earth for man's service; but is not the best bearing metal for reasons that any apprentice can explain. The world's greatest metallurgical chemist, a man who gave twenty-five of the best years of his life to investigation of the bearing metal subject for the largest single user of soft metals on the round earth, summed up the whole matter in the single and simple statement: "That metal is best which is softest, and at the same time strong and cohesive enough to stand the mechanical limits of load-weight and speed." Now, where is there a practical man who does not know that the mechanical limit is two thousand pounds to the square inch of bearing surface, while the fixed rule based on common sense and mathematics is to have the length of the bearing three times the diameter of the shaft? So with these simple, safe and sane facts coming from the evolution, study and experiment of mechanics as well as metallurgists, after the waste of much time and money in opposite and false theories, it is most surprising that any man would base his theory of efficiency on market or money values of materials.

I am trying to keep within reasonable limits of space and to eschew technical terms, as well as to not get away from the main question, that of taking issue with Mr. Wright where I know he is in error, and there is so much of truth and good sense in the most of his article that I hesitate in coming back at him. But it is not good advice to say that "Five grades of bearing metals will suffice for any service," and I want to get our friend right on this fact, that there is absolutely no difference in actual service so far as the bearings are concerned, between the hubs of a pair of roller skates and the main propeller shaft of a Dreadnaught. For if the skates have a hub ¼-inch in diameter and ¾-inch long, and the battleship shaft is 16 inches in diameter with the bearings 48 inches long, there will be exactly the same weight per square inch on the bearings, and speed has nothing whatever to do with the case except high speeds have a tendency to lighten the load, and lubrication, not the metal in the bearings, is the factor to reckon with, so it is necessary to have but one kind of metal—*the right kind*—for all machinery. Hence there is no need of 57 varieties, or five kinds, and I am sure my readers will agree that it would be false economy to put the designated No. 1 and No. 2 grades in the hangers and small machinery parts of all classes because the metal is cheap. The fact is the greatest economy may come from having the proper metal in the hangers as well as in the engine or machine.

To prove my case I am prepared to demonstrate anywhere, at any time, with comparative tests by placing one standard, correctly made and properly balanced metal in all the bearings of 20 or 100 different machines from buzz fans to battleships, and show with actual service the very minimum in cost for installation, material and service, with a long saving in lubrication, and a definite standard as against any variety of mixtures or formulas.

Mr. Wright is absolutely correct in his closing statement that

"The users of metal generally have to rely on faith in the firms that have established a reputation for their goods, and that such firms are always able to obtain a better price for their product." We take that flattering unction unto our own soul, since we make and sell one metal only, sell more of it than all of the 57 varieties combined, and the sun never sets on Frictionless.

R. H. EVANS,
General Manager, Frictionless Metal Company.
Chattanooga, Tenn., June 20, 1913.

SILVER; ITS EXTRACTION, STRUCTURE AND NOVELTY

TO THE EDITOR OF THE METAL INDUSTRY:

The paper by James Scott, under the above caption, appearing in THE METAL INDUSTRY for June, 1913, contains statements that are erroneous and some that are misleading. They ought to be corrected, as wrong impressions are apt to result in future trouble. To begin with, the statement that "North and South America and Australia are the principal silver-producing countries," is too general to give any real information. One might as well say that the Eastern and Western hemispheres produce the most silver. As a matter of fact Mexico is the greatest silver-producing country, and furnished 76,500,000 fine ounces of the metal in 1912. Mexico is followed by the United States, Canada and Australasia in the order named. South America does not figure largely as a silver producer at the present time, as there has been comparatively little mineral development there.

There are three principal methods for silver extraction, as has been stated by Mr. Scott, but their order of importance is not as he has placed them. Amalgamation is an ancient method, one of its variations being the so called patio process, invented by Bartolomé de Medina at Pachuca, Mexico. In the patio process the ores were rarely roasted, but were usually treated directly with salt and copper sulphate in the patio, or yard, not necessarily round, but having a well-paved floor, and the material mixed by horses or mules walking about in the pasty pulp, ensuring the intimate contact of the mercury added with the pulp and its intermixed chemicals. Time and the Mexican temperature accomplished the same result which was later obtained by steam heat and improved mechanical means. Amalgamation, however, is not at present in use in connection with silver metallurgy, except when it is an incidental or in cases like the Nipissing mine, at Cobalt, Ontario, where exceptionally high-grade ores are handled in comparatively small quantities. Amalgamation was abandoned, not because it failed to recover the silver, but on account of its great cost.

The other processes mentioned by Mr. Scott, such as leaching of argentiferous matte, the Ziervogel process, hyposulphite leaching and many others not mentioned, have long since passed into practical oblivion and are no longer largely used in silver recovery. Smelting is undoubtedly responsible for the bulk of silver production, but it is only applicable to rich ores on account of its cost. The process which makes available the greater part of the silver contained in low-grade ores, the cyanide process, is not mentioned by Mr. Scott at all. Much of the silver production of the present time is from low-grade material which carries from ten to twenty ounces per ton, and much of this ore would not be available but for the economies in operation obtained by cyanidation. By this process the metal is dissolved in a solution of an alkaline cyanide, usually KCN or NaCN, separated from the pulp by filtering or settling, and the silver precipitated again in a practically pure state by means of contact with zinc or aluminum. On account of its wide scope and efficiency of operation this process may be said to be the most important metallurgical process known at the present time.

HERBERT A. MCGRAW.

New York, June 24, 1913.

EXTINGUISHING FIRES WITH SAWDUST

To the Editor of THE METAL INDUSTRY:

Referring to the article "Extinguishing Fires with Sawdust" in the March issue of your journal, I believe a note of caution should be sounded. In the use of sawdust for the purpose mentioned, of extinguishing fires in lacquer, wood alcohol, benzine or gasoline, the statement is made that "sawdust itself is not very easily ignited, and when it does become ignited, burns without flame. . . . The character of the sawdust, whether from soft wood or hard wood, appears to be of little or no importance. The amount of moisture contained in the sawdust is apparently not a factor. The dry sawdust . . . . was evidently as efficient as the untreated sawdust."

A couple of years ago a manufacturer who was using wood of various kinds became suspicious as to the inflammability of the fine dust which gathered about the shop. He submitted samples of this dust to the Bureau of Mines for tests of its inflammability or explosibility. These tests were made, and it was found that this fine dry wood dust not only gave higher pressures per unit than the standard Pittsburgh coal dust, but that the inflammation accompanied by pressures started at a very much lower temperature of the igniting coil. Three kinds of dust were tested, pine, oak and mahogany, and this was the order of their inflammability or explosibility; the mahogany dust giving the highest pressures. While, in many cases, and undoubtedly in the tests cited in the article above mentioned, the sawdust was of a coarse character, there may be times when a finely divided wood dust collects, and if this were thrown on a flame in its dry state it is entirely conceivable that a rapid inflammation, or low order of explosion might result. In general, it would seem far safer to treat the sawdust by sodium bicarbonate, as suggested, which, as the author states, would further decrease danger of fire from the sawdust itself.

GEO. S. RICE,
Chief Mining Engineer.
Department of the Interior, Bureau of Mines.
Pittsburgh, Pa., June 19, 1913.

NEW BOOKS

ELECTRO-PLATING AND ELECTRO-REFINING. By Watt and Philip. 1913. Size 6 by 8 inches. 680 pages, including index and 160 illustrations. Bound in cloth. Published by Crosby Lockwood & Son, London, England, and D. Van Nostrand & Company. Price $4.50. For sale by THE METAL INDUSTRY.

This work is a second edition, revised of Alexander Watt's "Electro-Deposition," and has been largely re-written by Arnold Philip, Admiralty Chemist, Great Britain. The present edition of this excellent work appears under a modified title and has for convenience been divided into two parts; namely, Part I, or Electro-Plating, and Part II, or Electro-Metallurgy. The portion of new matter in this edition, which is original work and of considerable importance, is contained in Chapters 2 and 3 of Part II, and is an attempt to systematize the electro-refining of copper—and (it may be added) of all metals, from the financial side—for a similar treatment is with very slight modifications capable of being applied to the electrolytic refining of any other metal. Seven chapters of electro-metallurgy in the book are entirely new, with the exception of an account of Keith's process of refining lead, Cowles' process of producing alloys of aluminum and Montagne's process for recovering tin from waste tinned iron. In all the net result of the revision to which the book has been subjected is the enlargement of the text about one hundred pages and new illustratives; diagrams have been freely introduced to bring the work thoroughly up to date. This revised edition is entirely up to the high standard set for it by its predecessor.

METALLIC ALLOYS. By G. H. Gulliver, 1913. Size 5¼ by 8 inches. 409 pages, including index and 310 illustrations. Bound in cloth. Published by J. B. Lippincott Company, Philadelphia, Pa. Price $3.25. For sale by THE METAL INDUSTRY.

This is the second edition of the original work by Gulliver and has been revised, largely re-written and greatly enlarged. The book is addressed mainly to engineers and to students of engineering who desire some knowledge of the minute structure of metals and alloys, and of the manner in which the structure develops and changes. The book, obviously then, is not intended as a guide to the practical manufacture of alloys, except in so far as a knowledge of the equilibrium conditions, and the unstable conditions of mixtures is of assistance in regulating their composition and heat treatment. The subject matter of this book has formed part of various courses of lectures on alloys delivered in the Engineering Department of the University of Edinburgh and in the Heriot-Watt College, Edinburgh, Scotland.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

THE METAL INDUSTRY has had so many inquiries in reference to shop problems that have been previously published that it is deemed advisable in future to number each question. Since the inception of the department of Shop Problems 1,822 questions and answers have been published, without taking account of the many answered direct and by mail.—Ed.

ALLOYING

1823

Q.—Would you be kind enough to let me know through your valuable paper what alloy composition gas pipes are made of?

A.—If by gas pipes you mean the tubes through which the gas is conveyed, these are made of brass, about 62-4 of copper and 36-38 of spelter. If you refer to the outer covering of a gas chandelier, these are made of seamless drawn brass tubing composed of copper 66, spelter 34.—K.

CLEANING

1824

Q.—We are having some trouble in obtaining an absolutely clean surface on our brass castings, which are tinned and babbitted and used for bearings. These castings are red brass mixture, with 84 per cent. copper, 10 per cent. lead and 6 per cent. tin, and having anchor holes on the inside for the babbitt, makes it very difficult to sand-blast these holes so that they are absolutely clean. What would you advise?

A.—Would suggest that you use the following methods to produce a clean surface for tinning and babbitting your castings:

First—To remove the sand, pickle in a mixture of two parts of commercial hydrofluoric acid and one part of water, using a warm solution. Immerse the castings in the bath for thirty minutes, then wash in cold water.

As hydrofluoric acid attacks glass or anything of a vitreous nature the regular earthenware acid jars cannot be used. It is advisable to have tanks made up from wood and lined with lead from 1/16 inch upwards and have the seams burned in not soldered. Use lead coils for heating. Plain wooden tanks may be used, but the life of them is very short.

Second—After the pickling and washing, as stated above, prepare an acid dip consisting of the following:

Yellow aqua fortis, 38 per cent.	2 gals.
Sulphuric acid (commercial), 60 per cent.	1 gal.
Water	½ gal.
Common salt	1 oz.

Mix in the order given above very slowly and then allow to cool. Immerse your castings in this dip for one or two seconds, remove quickly and wash in clean water very thoroughly and dry out if necessary by the aid of boiling water.

The acid dip may be prepared in the usual earthenware pots made for the purpose, as the acids do not affect them. If much cleansing is to be done the pots or jars containing the above mixed acids should be surrounded with running water to keep the temperature of the acid down, which rises quite rapidly when the dip is worked constantly. Better results are obtained when the acid is maintained at 60 to 70 degs. F.—C. H. P.

1825

Q.—In lacquering silver I take it right from the wheel. They use red rouge and it shows very rough on the work. What will take its place?

A.—You can remove the red rouge after coloring your silver plated goods by washing them in a warm solution of 1 ounce of borax and two ounces of washing soda to every gallon of water.

Or the articles may be washed in benzine or gasoline using a soft painter's sash brush, then dry out carefully with finely sifted maple sawdust and then dust off by using a slow running canton flannel wheel from 8 to 12 inches in diameter and 2 to 4 inch face. You can also wash the articles in your lacquer thinner in the same manner, only use a second wash of thinner and then lacquer direct.—C. H. P.

COLORING

1826

Q.—Kindly give me a formula for a black that will take direct on steel, such as you see on pants buckles, etc.

A.—The only satisfactory plated deposit for trouser buckles would be black nickel. The buckles should be given a light plate in a regular nickel bath before black nickeling (see formula for black nickel solution published in the February, 1911, issue of THE METAL INDUSTRY).

The other method frequently used is the Coselletizing described in the May, 1911, issue of THE METAL INDUSTRY.

The other method is to melt nitrate of potash in an iron crucible to a fluid state, then add a small amount of black oxide of manganese. The polished articles are immersed by the aid of wires or wire baskets in the molten bath until a gun metal finish is produced, then removed and immersed in boiling water and dried out by passing through benzine or gasoline, and then by the aid of maple sawdust. In using this method of finishing the articles must be perfectly dry before immersing in the molten bath of nitrate of potash.—C. H. P.

CUTTING

1827

Q.—We are having considerable trouble cutting threads one-half inch long, 18 pitch straight threaded flush to a shoulder using die head and chasers.

A.—To cut a perfectly straight thread to a shoulder use a die-head with outside trip lever. In some cases where threads are to be cut flush to a shoulder it is not practicable to do it with one die-head and get a perfectly finished thread. Use two die-heads on the turret, one with roughing dies to bring the thread as far up as possible, and the other having chasers without lead or ground in from which will finish the thread clear to the shoulder.—P. W. B.

1828

Q.—What is the best lubricant to use when turning or threading copper?

A.—When cutting threads on hard or soft copper, the grinding of the chasers is a very important matter. For working copper the chasers should be ground with a hook shape, and the softer the copper the more pronounced the hook should be. If run at a pretty good speed the work is less apt to tear. A good cutting compound for copper is composed of two parts mineral lard oil and one of kerosene. A suitable lubricant should always be used in screw cutting operations. It makes a better thread, prevents wear and overheating and keeps the die cleaner by preventing an accumulation of chips.—P. W. B.

DIPPING

1829

Q.—Kindly let us know the formula for dipping chandelier parts, and how the parts are prepared for dipping?

A.—In preparing chandelier parts for acid dipping the following method should be followed:

Place a number of pieces from soft copper or brass wire and then immerse in a hot potash bath to remove oil or grease. The potash dip should consist of 6 ounces of caustic soda or potash to each gallon of water. It should be maintained nearly boiling by the aid of steam coils. The tank should be of iron. It may also be heated with a Bunsen gas flame.

After potashing for a short time remove and wash in clean, cold water and then immerse in the acid dip, which should have been prepared sometime previous. The dip should consist of the following:

Yellow aqua fortis, 38 per cent.	2 gals.
Oil of vitriol, 66 per cent.	1 gal.
Common salt	1 oz.
Water	1 qt.

Immerse the cleansed parts in the acid dip, moving them while in the acid quickly to and fro, then remove and immerse in clean water. After washing well immerse in a dilute cyanide dip to remove any acid stains that may form. This dip consists of 1 gallon of water and 2 ounces of cyanide of potassium. Arrange a dip of sufficient capacity so that the articles can be completely immersed, rewash in clean water, pass through boiling water and dry out by the aid of maple sawdust.

If much dipping is done the pot containing the acid, which should be earthenware, should be surrounded by running water to keep the temperature of the acids normal or about 60 to 70 degs. The acid dip may be constantly replenished by adding small amounts of aqua fortis and sulphuric acid as occasion requires. No water should be added after the first addition, as sufficient is carried into the acid by the washing of the articles.—C. H. P.

FINISHING

1830

Q.—Can you tell us what China bronze finish is?

A.—China bronze finish is a somewhat lighter finish than the regular Japanese finish, having more of a brown than a reddish tone. We would suggest that the following method be followed to produce this finish:

First—Copper plate the articles for a short time, then scratch brush while wet.

Second—Immerse in a very dilute solution of sulphuret of potassium and cold water. This should be only momentarily. Then wash and scratch brush wet. The surface in the first brushing should only be slightly darkened.

Third—Repeat the operation twice, then immerse in the dip and wash and dry out. Then finish dry, using a soft or worn brass brush and then lacquer with a good heavy lacquer. The color should then be a beautiful nut brown or Chinese bronze.—C. H. P.

1831

Q.—Can you advise us as to what is the most time saving and economical method of applying what is known as the X-ray finish to the interior of aluminum cooking utensils?

A.—By the X-ray finish we presume you refer to the burnished appearance on the inside of aluminum cooking utensils of foreign make as noted. This finish is produced by what is termed as lathe burnishing. The articles are held in chucks on a regular spinning lathe that is run automatically and the burnishing tool passes rapidly over the surface of the articles. Kerosene oil is usually used as a lubricant for the burnishing tool. We suggest that you take up the matter with manufacturers of automatic burnishing lathes which are largely used in producing reflective surfaces upon aluminum and silver. They would be pleased to give you further information upon the subject.—C. H. P.

GALVANIZING

1832

Q.—I would like to know if galvanizing of castings, etc., can be done without striking in another solution?

A.—Electro galvanizing upon such articles as you refer to is applied direct without any intermediary deposit. The trouble you experience in getting a satisfactory deposit is probably due to the fact that you are using a solution of too low a concentration. For mechanical plating we suggest that you prepare a solution consisting of the following:

Sulphate of zinc	3 to 4 lbs.
Aluminum sulphate	4 ozs.
Common salt	4 ozs.
Water	1 gal.

We believe that with a solution of the proper density prepared with the above proportions of material you will obtain satisfactory results, providing you use sufficient voltage, which should not be less than 10 volts.—C. H. P.

HARDENING

1833

Q.—I would like to know a good way to harden chrome nickel steel?

A.—General:

The following specification covers the process to be followed in heat treating chrome nickel steel having a .30 per cent. carbon content.

Process:

Operations—
Heating
Quenching
Drawing

Heating—
Place the parts to be treated in a furnace in such a manner that the heat will not distort them. Raise the temperature uniformly to 840 degs. C. (1545 degs. F.).

Quenching—
Quench in water directly from the furnace.

Drawing—
Reheat uniformly in a furnace to the proper temperature, as indicated in Treatment No. 1 and 2, for tempering or "drawing back" and allow to cool uniformly and slowly.

Treatment No. 1—
To be specified when ductility is required. Quench from 840 degs. C. (1545 degs. F.) and draw at 650 degs. C. (1200 degs. F.).

Treatment No. 2—
To be specified when maximum tensile strength is required. Quench from 840 degs. C. (1545 degs. F.) and draw at 500 degs. C. (930 degs. F.).—J. L. J.

MOLDING

1834

Q.—We wish to know how to make spelter hat dies in sand molds?

A.—The molds should be thoroughly dry, so that the metal does not chill in pouring, and properly vented so that the air and gases forming can readily escape. We believe you would obtain quicker, better and more satisfactory results if you did your spelter casting in iron molds. To obtain perfect castings French or Winsted Locks sand should be used and the molds should be smoked with a turpentine torch to give the best results.

In casting spelter the grade of metal used plays an important part. New Jersey, Bertha or Prime Western spelter should only be used for the purpose.—C. H. P.

SOLDERING

1835

Q.—I desire to close plate on large copper tubes made up in circle and straight in three metals, silver, brass and nickel. Ordinary plating is not thick enough.

A.—It requires considerable experience to do a good job in close plating. Briefly stated, it is a method of soldering a thin sheet of the desired metal upon another metal. The metals mostly used are brass and silver, although other metals such as copper or nickel may be used. To accomplish this, procure the metal "dead soft" and then cut so that a good close fit will be obtained upon the surface you desire to close plate. Then heat the surface and apply a solder consisting of 2 parts tin and 1 part lead, using the regular chloride of zinc flux; but first be sure that the soldered surface is smooth. Now coat the brass, silver or nickel on one side with the same flux and apply with a large soldering copper. This copper should be different from the ordinary copper. The end should be two to three inches long and made half round so that the metal may be smoothed down while applying the heat to the surface of the metal to be soldered onto the underlying metal.—C. H. P.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,061,066. May 6, 1913. **Plated Metallic Body.** George A. Goodson, Minneapolis, Minn.

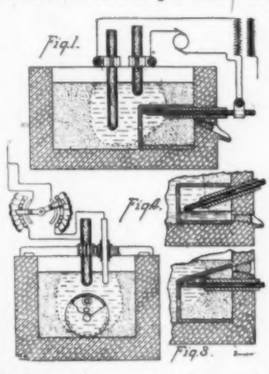
This invention has for its object to provide a plated metallic body which will be efficient to resist corrosion under the action of the elements to which said product is naturally exposed in use.

To this end the invention consists of a plated metallic body having the characteristic features shown in the cut.

Iron, using this term in its broadest sense, so as to include steel and all similar metals, is the body primarily intended to be plated, but the invention may be realized, possibly, with other metal as the body to be plated. The body to be plated may be in the form or shape of sheet metal, wire, rods, or any other of the manifold forms ordinarily taken by iron and steel for commercial use. Iron plated with tin is commercially known as tin-plate; iron coated with an alloy of tin and lead is known as terne-plate, and iron coated with zinc is known as galvanized iron.

1,060,839. May 6, 1913. **Electric Furnace.** David J. Hauss, Aurora, Ind.

This invention relates to improvements in electrical furnaces. One of its objects is to produce an improved furnace, as shown in cut, adapted to produce metallic alloys and chemicals or compounds, and to control the relative proportions of the components. Another object is to provide improved means to regulate and control the temperature of the furnace, and to vary and control the relative anode and cathode temperatures. Another object is to provide improved means to accumulate, preserve from alteration and remove the product.



One of the claims made by the inventor is: An electric furnace comprising a container adapted to hold a body of material to be treated, a metallic electrode adapted to serve as an anode and connected to a source of direct current, an electrode connected to a source of alternating current, an electrode adapted to serve as a cathode and connected to said source of direct current and to said source of alternating current, the action of said direct and alternating currents serving to fuse the material to be treated, and said direct current between said anode and cathode serving to electrolyze the material to be treated and to deposit one of its components at said cathode, and also to transfer the material of said anode to and alloy it with said cathode deposit.

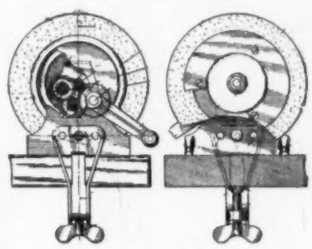
1,063,618. June 3, 1913. **Guiding Machine.** James M. Thompson, Milwaukee, Wis.

This invention relates to improvements in grinding machines.

The object of the invention is to provide a compact structure, as shown in cut, in which the motion transmitting gearing is disposed within and is so located that it will not interfere with the manipulation of tools with reference to the grinding wheel, and in which said gearing will be concealed within the grinding wheel itself, no part of the driving mechanism being visible except the operating crank.

Two of the claims of the invention are as follows:

The combination with a supporting casing member, driving connections mounted upon said casing member, a rotary casing member cooperating with said supporting casing member to inclose said driving connections, and a grinding wheel mounted upon said rotary casing member.



The combination with a set of fixed and removable casing members assembled to form a gear receiving cavity, an auxiliary bearing member supported from the fixed casing member, shafts having bearings in the fixed casing member and bearing member respectively, a train of intermeshing gears on said shafts, a crank, a connection between the crank and driving shaft of said train, a connection between the driving shaft of said train and the movable casing member, and a grinding wheel mounted upon the movable casing member.

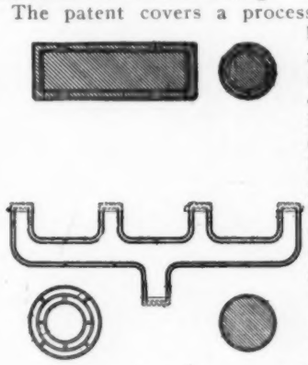
1,063,417. June 3, 1913. **Process of Making Compound Hollow Metal Bodies.** Edward G. Cook, Brooklyn, New York, assignor to Brass and Copper Production Company, N. Y.

This invention relates to a process of manufacture of articles comprised of hollow or tubular metal bodies.

For the purpose of illustrating forms that may be made by the process and also to boring out the utility thereof, there is shown in the accompanying drawing a tubular body known as a water jacketed gas engine manifold.

One of the advantages of articles made by this process is that the walls can be thinner than is customarily obtained by the usual method of casting.

The patent covers a process for making hollow metal bodies comprised of a plurality of metal bodies one inside the other and of like contour consisting of molding into the desired shape a core form comprised of fusible material of low melting point, and electro-depositing thereon a coating of metal and then covering the body of metal formed thereby with a covering of like fusible material, and then covering the same with a coating of electro-deposited metal and again coating the said outer metal body with another coating of fusible material, another coat of metal being electro-deposited thereon and then cutting off the ends of the metal bodies formed thereby and therein at predetermined points and fusing out the said core forms thereby leaving a plurality of hollow metal bodies of like contour one inside the other.

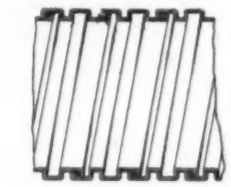


1,064,432. June 10, 1913. **Flexible Metallic Tubing.** William Berryman and Arthur Redgrave, of Penders End, England, assignors to the United Flexible Metallic Tubing Company, Limited, of Penders End, England.

Flexible metallic tubing is manufactured by helically coiling a strip of metal corrugated in various forms, as shown in cut, but in such a manner that the successive convolutions, when coiled, interlock with each other forming a continuous tube. To render such tubing proof against leakage it is usual

to insert packing at that part of the strip of metal where the joining edges of the strip overlap.

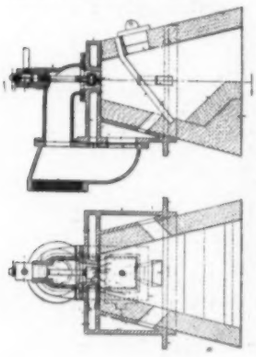
The present invention relates to improvements in flexible metallic tubing of the above interlocked character, whereby the manufacture is rendered more expeditious and the cost is considerably lessened while at the same time the tube is as strong as tube made in the ordinary way.



It consists in corrugating the strip prior to or in the course of the coiling of the tube in such a manner that when coiled there are one or more additional channeled convolutions provided between the actual convolutions and edges of which serve to interlock the coiled strip, in forming the additional convolutions of a shape similar to that of the interlocking convolutions, and in parallelism therewith.

1,063,352. June 3, 1913. **Oil Burner.** Francis A. Jacobs, Montreal, Canada.

This invention relates to improvements in oil burners and the main object is to provide a burner so arranged as to completely atomize the oil.

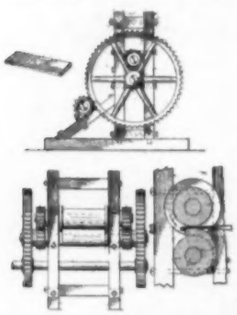


A further object is to provide means for thoroughly mixing the gas and air to thoroughly consume the spray and at the same time obtain a maximum of efficiency.

To accomplish these objects the inventor provides, as shown in cut, a burner adapted to discharge the fuel oil in a fine spray into the combustion chamber. As the oil enters the combustion chamber it is mixed with air under pressure, the air currents being so regulated and directed as to completely atomize the oil. This spray is then further mixed with heated air before passing to the flame.

1,062,807. May 27, 1913. **Metal Rolling Machine.** Samuel D. Sturgis, Los Angeles, California.

This invention relates to improvements in metal rolling machines, and it is an object of the invention to provide a machine for rolling metal pieces to a tapered form without spreading the same to a greater width.



It is also an object of the invention to provide a machine with metal shaping rolls, as shown in cut, adapted to taper strips of metal without increasing the width thereof, the relative action of the rolls being capable of accomplishing this purpose.

It is an important feature of the invention that one roll shall have a different action and effect upon the metal to be rolled or shaped from the other roll and the result desired in tapering a metallic spring or other piece of metal without flaring it, is best obtained by making one roll cylindrical, while the other roll is of a cam shape, its surface following spiral lines in cross section, whereby an eccentric surface is afforded the roll.

1,064,713. June 17, 1913. **Composition of Matter for the Treating of Molding Sand.** Thomas E. Coupe, Toronto, Ontario, Canada.

The objects of the invention are, to effect a saving in the consumption of new sand in forming the molds, to produce a cleaner and better surfaced casting, thereby effecting a saving in the cost of finishing, and to provide a composition of matter which will form an effective binder enabling the use of a large percentage of floor sand in making a mold.

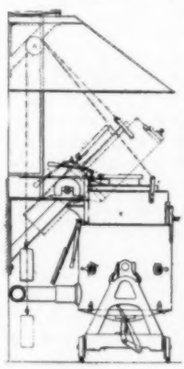
The invention consists essentially in the novel admixture of ingredients in or about the proportions hereinafter set forth.

The following ingredients in about the proportions given are preferred as giving the best results: Linseed cake meal about 8 per cent., sea coal about ¾ per cent., water about 91¼ per cent.

The above ingredients are thoroughly mixed together into a liquid state and this liquid forms the binding mixture which holds the sand particles firmly together when tamped to form the mold or core.

1,062,970. May 27, 1913. **Portable Crucible Furnace.** Matthew Harvey, Walsall, England.

This invention has reference to portable crucible furnaces and particularly to those of the kind in which the furnace proper containing the crucible is carried by and adapted to swing about side trunnions, as shown in cut, when pouring the melted metal out of the crucible, or for the purpose of turning the furnace upside down for examination and cleaning of the blast passages or for relining of the bottom of the furnace.



The inventor claims: In a crucible furnace, an outer shell having an annular blast chamber, a plurality of twyers passing tangentially through the shell and having communication with the blast chamber, and hollow cocks located in the outer ends of the twyers for regulating the blast therethrough, the cocks being provided with means for rotating them, the outer ends of the hollow cocks being provided with a transparent closure, whereby the cocks will serve as sight holes.

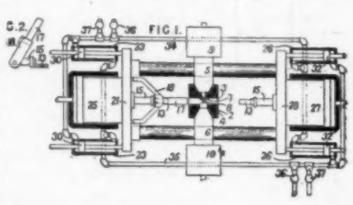
1,065,333. June 24, 1913. **Machine for Making Cartridge Shells.** Chas. A. Bailey, Cromwell, Conn.

1,065,336. June 24, 1913. **Coil Spring Forming Machine.** Geo. E. Bigelow, Waterbury, Conn. Assigned to the Mattatuck Manufacturing Company of the same place.

A RECENT ENGLISH PATENT

27,918. **Extruding Metals.** Lake, H. W., 7, Southampton Buildings, London.—(Chase Rolling Mill Co.; North Main street, Waterbury, Connecticut, U. S. A.) Dec. 12. [Class 83 (iv).]

Tubes, rods, &c., are extruded through one or more dies arranged in the side of chamber, into both ends of which blanks are introduced and pressed by means of plungers moving synchonously. In making a tube, a die 7 and mandrel 8 carried by tapered holders 5, 6 are forced and held in openings 4 in the sides of block 2 by hydraulic cylinders 9, 10. The plungers 15, carrying the blanks on holders 13, are advanced thus inserting the blanks in the chamber 3 while the holders 13, which are arranged so as not to enter the chamber 3, slide back on the plungers. The heads 21, 28 which carry the plungers are advanced by hydraulic plungers 25, 27, to squirt the metal through the die 7 and controlled so as to advance at the same speed by pistons 30, 32 working in hydraulic cylinders 23, 26 having all their right-hand ends connected by pipes 35 and their left-hand ends connected by pipes 34. Inlet valves 36 and safety-valves 37 are provided in these pipes, and a plunger 17 on arms 18 pivoted to the head 21 and normally turned out of the way is used, after squirting and withdrawing the dies, to remove any material left in the chamber 3.



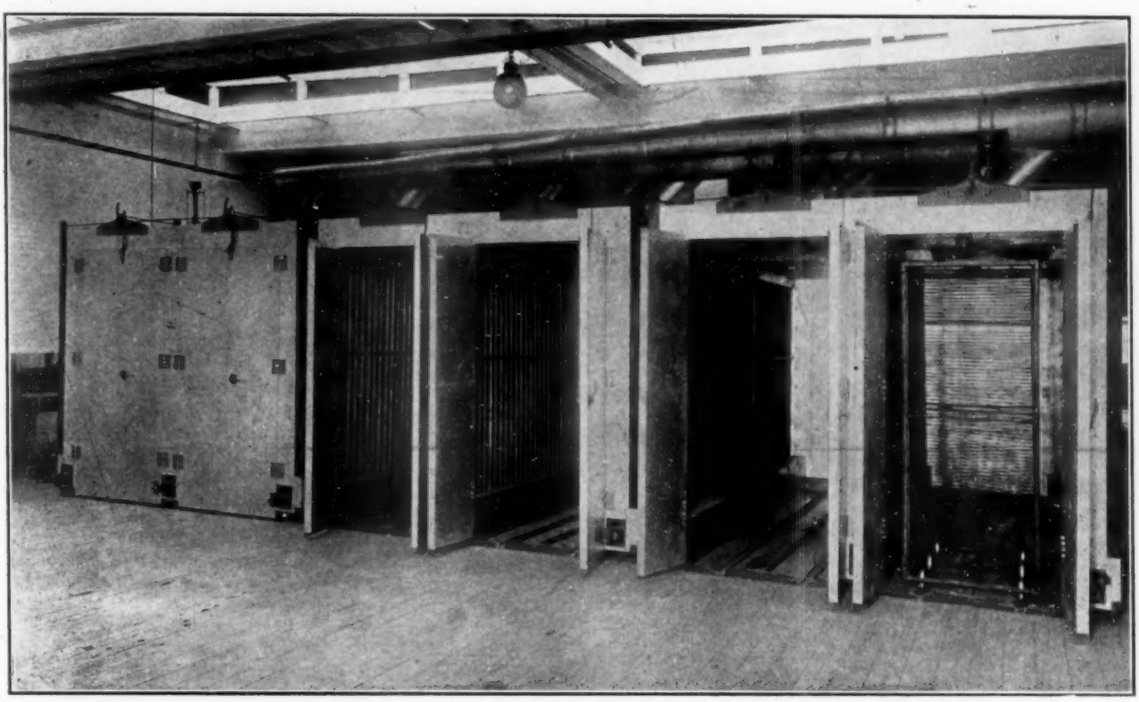
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

NOTABLE CORE OVEN INSTALLATION

The battery of core ovens shown in the cut was recently manufactured and installed by Hermann Gehnrich, manufacturer of the Gehnrich Sectional Portable Ovens, in his new building, 60 and 62 Franklin avenue, Brooklyn, N. Y., a cut of which was shown in THE METAL INDUSTRY for June.

This was the first order completed in their new building and represents a battery of three ovens each 9 feet wide, 14 feet deep and 7 feet 9 inches high. The photograph was taken at their plant just before shipping and gives an idea of the space set aside for this part of the work. The ovens are of the indirect gas-heated radiator type and are to be used for drying lithographed tin plates which are placed on trucks and rolled into the oven. Each oven is fitted with three radiators, one on either side and through the center, providing a perfect heating system and with the use of the ceiling fans the heat is circulated and distributed most evenly throughout the oven. This type of oven has proved most successful in baking the new acid-proof lacquer which requires an absolute temperature due to the fact that the lacques is so sensitive that a variation of a few degrees of heat will discolor the work.

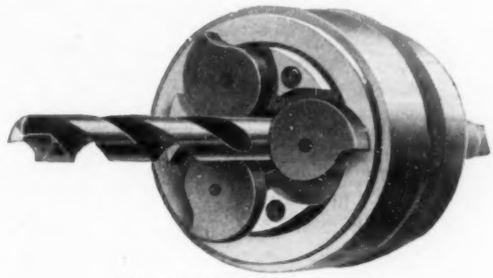


INSTALLATION OF 3-CORE OVENS BY HERRMANN GEHNRICH.

EMRICK DRILL CHUCK

This drill chuck which has been developed by the Automatic Drill Chuck Company, under the name of the Emrick Automatic Grip and Release Drill Chuck, is designed to operate while the machine is running at full speed and is claimed to withstand excessive wear. The Emrick chuck is claimed also to be dirt proof. Whatever dirt enters will be cleaned out by the action of the cam grips which are shown in the cut.

A novel form of construction provides for the overcoming of wear on the chuck. A hole is ground weaving or cam-like in the outer shell or thrust ring of the chuck. The shell being free to revolve, will automatically assume different positions in relation to the cam grips. One of these positions being at high and the other at low point, causes the cam grip to assume a different center distance and to take a different angular position on the same size drill. This allows no one spot of the cam grips to receive all the wear, but distributes it over about 3/16 inch wearing surface for one size drill. Full instructions for the operation and care of this chuck are given in catalogue "MB" to be had from the Automatic Drill Chuck Company, 99 John street, New York.



THE EMRICK DRILL CHUCK.

STANDARD ROTO PLATER

The plating barrel which is shown in the accompanying cuts in Figs. 1 and 2 is now being manufactured and sold by the Detroit Platers' Supply Company, successor to D. B. Moyer, dealers in electro-platers, polishing and buffing supplies, Detroit, Mich.

The mechanical plater is described in a circular which accompanies it together with directions for operating same, as having five special advantages over other types of barrels. The first claim made is that a saving of 50 per cent. in time to deposit the same amount of metal is possible by the use of this barrel.

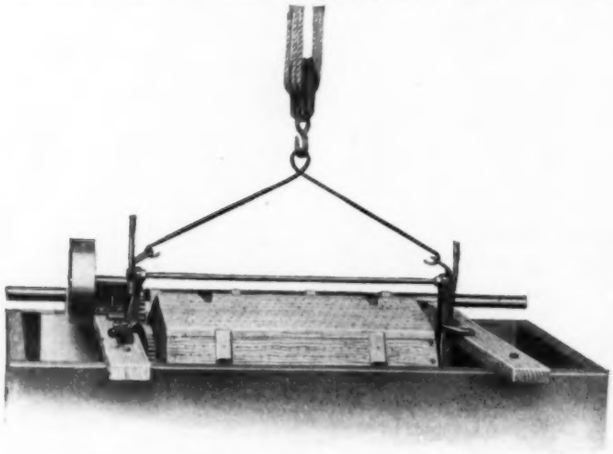


FIG. 1. THE ROTO PLATER READY FOR WORK.

A second advantage is that a special high voltage dynamo is not required, but a regular plating machine will operate the barrel satisfactorily. This barrel is claimed to be the only plating barrel that has the anode inside close to the work to

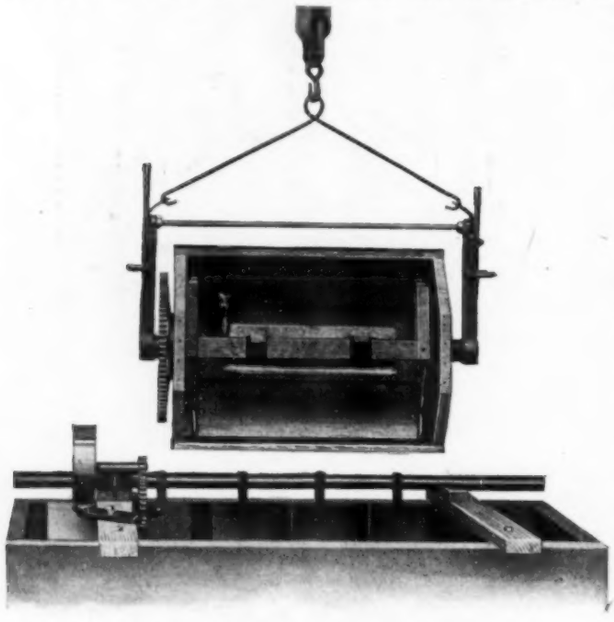


FIG. 2. THE ROTO PLATER WITH BARR EL RAISED.

be plated, thus insuring perfect saturation of the solution and perfect plating. Furthermore, it is stated that no metal is deposited on any part of the barrel, thus saving a large amount of metal and current, neither is a special tank required for this barrel. The only provision that is made for its use on any tank is that it shall be large enough.

For use in the plating room for either hand work or electric cleaning and in connection with the plating barrel this company are introducing their Royal Cleaning Compound, which is claimed to be absolutely perfection.

Further details may be obtained by corresponding with the Detroit Platers' Supply Company.

PROGRESS OF ELECTROCHROMA*

By Ralph R. Schoonmaker.†

Nature's way of coloring metals is to produce, through the action of the atmosphere, gradual oxidation of the exposed metal surfaces. These oxides are of various colors, depending on the kind of metal and the atmospheric conditions. Copper and its alloys show a wide variety of different color effects and are the metals most generally used for ornamental purposes. For commercial practice natural oxidation is too slow and various chemical and other means are used to hasten the action. Iron, lead, spelter, etc., have no oxides which are ornamental, so are generally plated with copper or brass. There is always more or less difficulty in coating these metals and the subsequent treatment with chemicals is uncertain, slow and costly.

The principle of the "Electrochroma" process is to prepare "electrolyte" solutions from which "oxides" can be deposited under the same electrical conditions governing regular electro plating. On this principle we produce a stock of baths from which can be secured practically every metallic finish now on the market, also many new ones. It is not necessary to have a separate bath for every finish, but on the contrary from each bath a wide variety of finishes can be obtained, depending upon the voltage, etc. Indeed the color of the original deposit of some of the baths can be entirely changed by subsequent immersion, without electrical current, in what we call toning dips, of several colors, blue, green, brown, red, etc. Each will change the original color to its own, including all intermediate shades.

The bronze finishes are genuine, being chemically the same as the salts produced by acid corrosion on copper, etc. Baths are prepared in the dry salt form. It is only necessary to add water in making up the solution. Installation of this process will not necessitate any changes in present equipment, as the baths will operate on standard voltages in general use. The process has these advantages: Rapidity, only a few minutes deposit. Uniformity, being independent of the composition of the metals, atmospheric action, acid strength, etc., the finishes are more uniform. Durability, the deposit is hard, durable and complete oxidation means less liability to change color.

The cost of the plating salts used in this process is about one cent per square foot of surface plated (less than lacquer) while saving in time and labor as compared to corrosion at least one-half. The price of the bronze salts runs from $1.25 to $2.50 per pound, requiring three-quarters to one and one-quarter pounds per gallon of bath, which is equivalent to $1.00 to $3.00 per gallon. One gallon of bath on an average will cover about one thousand square feet. On a 100-pound order we allow a discount of 15 per cent. from these prices. If slaters or others write us what colors they are most interested in obtaining or send us finished samples we will be pleased to color free of charge pieces of work or samples of our own matching these effects.

In regard to the progress we have made with the process: When it was first brought out the baths were shipped in a liquid state and the solutions required a high voltage for operation. After a great deal of difficulty and expense we are now making the baths in the dry salt form, which makes it more practical for shipping and the manufacturer simply has to add water to make his required solution. From our experience in the last two years we have been able to make some refinements in the baths so that all our solutions will operate on six volts or less, or regular standard equipment.

As the conductivity of the baths has been improved the uniformity of deposition has increased in proportion. The process as it is now is entirely practical for coloring metals, and will without doubt eventually supplant the present unreliable processes. It is now in use in a number of the largest houses for coloring all kinds of metals, and we will be glad to give references upon request.

*Described in The Metal Industry, November and December, 1911.
†Vice-President and General Manager, Rojas Electro-Chemical Company, New York.

ALUMINUM SHOES

For workmen who are continually employed in wet and damp places where their feet must of necessity be saturated with moisture the aluminum shoe, shown in the cut, is claimed to fulfill a long felt want. This line of shoes is manufactured by the Racine Aluminum Shoe Company, Racine, Wis.

As will be seen in the picture there is a bar across the ball of the shoe which has been put there to give the flexibility to the sole that is so desirable and which would be impossible if the lower part of the shoe was made entirely flat. By this arrangement the shoe has been provided with a practically indestructible bottom and a shoe in which the wearer would not have to walk flat footed. These shoes, it is claimed, are ideal for use by farmers and others working in creameries, tanneries, bottling works, etc., in fact in any wet or damp place that gives rise to rheumatism, neuralgia, lumbago, stiffness of muscles, catarrh, tonsilitis, quinsey, throat troubles and colds of all kinds.

THE ALUMINUM SHOE.

Particulars and merits of these shoes together with illustrations of same are fully described in a little booklet, which the company would be very glad to send upon application by those interested in conserving their own or their workmen's health.

BRONZE JOURNAL BEARINGS

By J. F. Springer.

There is perhaps no single question in machine design that has attracted more attention than that of *bearings*. This is due largely to the extreme importance of this topic. Bearings are a necessary element in almost every kind and description of machine. The development and improvement in connection with *plain bearings* has been along three lines: (1) design; (2) lubrication; and (3) materials of the parts. Such bearings involve a *slide* of metal upon metal. It was found out long ago that if both the contacting metals were the same that the friction would generally be greater than where they were different. But even under the best conditions, dry metal sliding on dry metal will produce enormous friction and great wear. It is ancient history that this can be wonderfully reduced by the use of an intervening liquid—the lubricant.

Now the design of a bearing has to take account of the foregoing things. Smith & Marx in their recent work on "Machine Design" enumerate four items in design—(1) provision must be made to take care of possible rupture or an excessive yielding; (2) provision for permanence of form; (3) provision for the retention of the lubricant; and (4) provision against overheating. Let it be said at once that in order to cover requirements (2) and (4), account must be taken of the material which enters into the making of the boxes. It is easy enough to secure a metal which will supply a sufficient difference of structure to the material in the journal to make an easy-running box. Almost any kind of babbitt metal will cover this single requirement. But if heavy loads per square inch of projected bearing have to be supported, then a fairly high degree of compressive strength becomes essential. And so, it is necessary in the case of car wheel boxes to employ a stiffer material.

It has, accordingly, become quite general to construct bearings subject to heavy duty from some alloy of copper. The usual practice is to use a tin alloy of copper (bronze) or a zinc alloy of copper (brass). But copper itself is subject to damage from the oxygen of the atmosphere when raised to certain high temperatures. Phosphorus has been found to be a corrective of this. This peculiar element has a tremendous avidity for oxygen; and this is the quality that makes it valuable in connection with copper. If phosphorus is present under favorable conditions when copper is heated, the former substance will keep the oxygen busy and thus save the copper from the bad effects. But phosphorus is a difficult substance to manage. The pure material is probably never used.

When the good offices of this substance are required in connection with the purification of the liquid bronze or brass that is to go into a bearing, the pure chemical is not employed; but some complex material containing phosphorus is used instead. Thus, Metallic Phosphoro, made by the New Era Manufacturing Company, Kalamazoo, Mich., is a specially prepared metallic substance containing phosphorus. This material acts as a flux and deoxidizing agent in connection with the casting of bronze and brass mixtures. Its preconstitution is a carefully guarded trade secret. But its general operation and the like constitute no secret matter. One of the first things to note is the fact, known from experience that bearing boxes and other bronze castings must be poured from the first melting in which Metallic Phosphoro is employed, if the best results are to be obtained. For further information regarding this compound write the New Era Manufacturing Company, Kalamazoo, Mich.

POLISHING AND GRINDING HEADS

Winfield H. Smith, 6 and 8 Lock street, Buffalo, N. Y., is putting on the market a line of polishing and grinding heads especially suitable for manufacturers of jewelry and small metal goods, and which he claims are unequalled as regards design, workmanship and finish.

One style of polishing head, No. 9, is shown in the cut, the dimensions of which are as follows:

SMITH POLISHING AND GRINDING HEAD.

Height to center of shaft	6 inches
Length of shaft	10 inches
Diameter of shaft	½ inch
Pulley for round or flat belt	2¼ in. dia.
Net weight	3¾ pounds.

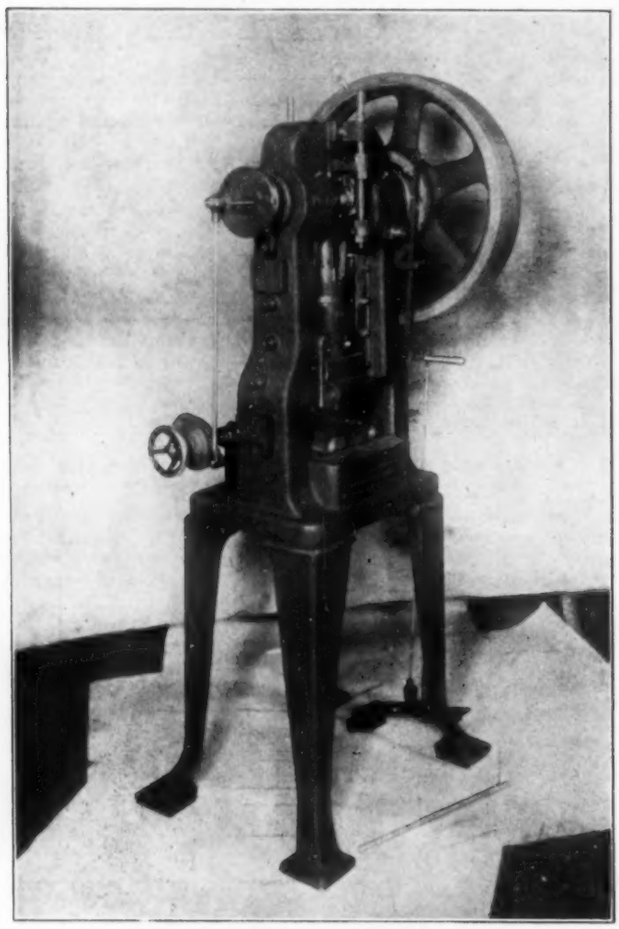
When ordered with chuck, one of the ends of the spindle is tapered and the other fitted to the chuck. These heads are fitted with large bearings and the bases possess unusual stiffness. Various other sizes, both for grinding and polishing purposes, are manufactured, regarding which full information can be secured from the manufacturer.

VANADIUM COPPER.

Vanadium copper is now being extensively used in the manufacture of high tensile bronzes.

NEW DOUBLE ACTING PRESS

The Standard Machinery Company, Providence, R. I., have just brought out a special double acting single cam press for the purpose of working celluloid and rubber, or any other materials that work better under heat and up to 600 degrees. In other words, it is a machine designed for pliable materials rather than metal. The purpose of this machine is for the heating, as well as the working of celluoid or rubber that it is to be operated upon. The press is used in connection with brass, as well as celluloid, and one of the main features of it is the assembling of the celluloid or rubber on gold plated collar button backs.



NEW DOUBLE ACTING SINGLE CAM PRESS FOR WORKING MATERIALS UNDER HEAT. MADE BY THE STANDARD MACHINERY COMPANY, PROVIDENCE, R. I.

The construction and principle briefly are as follows: The ram running between the outer gibs, or cutting ram, is actuated by two connecting rods which straddle the crankshaft and which operate at a stroke of 1 inch. The center, or drawing or forming plunger passes up and down through a bronze lining inside of the blanking ram, and also has a special and separate adjustment. The top of this ram is made in the form of a yoke and is supported by a spring adjustment to the upper part of the frame of the press. It is actuated by a single.

On the bolster plate of the press is set a special die holder, and in the photograph two holes can be seen in this which are for the purpose of inserting electric terminals. In the chuck or punch holder of the press is a recess for two more electric terminals. These terminals are at right angles to those in the die holder, and there is one in the rear and the other in front. This is electrically connected, and the die holder, as well as the punch holder, is cored out on the inside so as to permit these particular parts to be heated up to a temperature of 500 degrees.

The general dimensions of the machine are as follows:

Weight	1,600 lbs.
Flywheel	300 lbs.
Size of flywheel, 27 inches diameter	4½ ins. face
Adjustment	1½ ins.
Hole in bed	7 x 9 ins.
Distance between uprights	14 ins.
Ram to bolster	5½ ins.
Bed—front to back	14 ins.
Left to right	14 ins.
Speed	150 r. p. m.
Center of shaft to top of bed	26 ins.
Overall height	6 feet
Floor space	24 x 30 feet

SPRAY LACQUERING SMALL ARTICLES IN A TUMBLING BARREL

By Wm. App Jones.*

It has always been a considerable problem to lacquer properly large quantities of small metal work and have the work come out in good shape and at small cost. The method most commonly used has been to dip the work in a wire basket, shake out the excess of lacquer and spread on a steam table to dry. By this method there is usually a considerable loss of lacquer. When the work is dumped on the steam table it must be moved constantly until dry or the work will stick together. Even when great care is used there is considerable sticking of the work and, when the pieces are broken apart small defective spots show on the work.

The latest, and one of the most satisfactory methods of lacquering small work is to spray the work as it is slowly tumbled in an oblique, open ended tumbling barrel. The same type of barrel is used as that employed for polishing with leather scrap, etc. Practically every finishing room has such barrels. The barrel should of course be carefully cleaned and be free from all grease and moisture. The work to be lacquered is cleaned and dried, then placed in a drying oven long enough to be heated through and to a temperature of about 100 deg. F. It is immediately dumped into the tumbling barrel and the barrel is revolved at about eight revolutions per minute. It is essential that the barrel revolve very slowly. The lacquer is used very thin. While the work is tumbling the lacquer is sprayed on, moving the spray nozzle from front to back so as to have the pieces evenly covered. Before the lacquer is sprayed on, the pieces as they revolve will fall free and clear of one another. The work should be watched very carefully while spraying, and when the pieces begin to slip on each other as though oiled, instead of falling apart, stop spraying but continue to tumble. The heat contained in the metal is sufficient to dry the lacquer. As soon as the lacquer dries the pieces will again fall apart freely and the work can then be dumped on a screen. If desired the screen can be run into the drying oven to further harden the lacquer.

This method requires only the outfit usually found in a finishing room. It takes less lacquer than any other method. It leaves no drip on the work to cause trouble in fitting the work together in case it is to be assembled after lacquering. It is essential that the work be heated before tumbling. The lacquer should be used thin and not too much sprayed on. The barrel must revolve *very* slowly.

*Celluloid Zapon Lacquer Company, New York.

POLISHING HOOD

One of the special features of a polishing hood just put on the market is claimed by the manufacturers to be the clean-out drawer on the bottom, thus doing away with all the lost labor in pulling out slides and getting refuse and heavy material which usually stays there. This feature of the drawer also protects the fans, piping and other parts of the system. The hood is manufactured by the Northern Blower Company, sheet metal contractors, 4513 Storer avenue, Cleveland, Ohio, and this concern also installs complete systems of buffing, grinding, tumbling and other dust producing machinery, and special systems for pattern shops. Further information may be obtained by corresponding with them.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, F. N. Perkins, Freeport, Ill.; Secretary, C. E. Hoyt; Treasurer, J. S. McCormick, Pittsburgh, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association. The exhibition for 1913 will be held in Chicago, Ill., October 10-17.

Secretary Hoyt announced through a bulletin issued June 10 that the managers of the Exhibition Company had secured additional space for the exhibition which will be held in Chicago, Ill., October 10th to 17th. The total exhibition space, exclusive of aisles, is now 75,000 sq. ft., and the secretary reports that in a few weeks all this enormous space will be taken. The scope of the exhibition may be realized when we compare the present available space with that used at Buffalo and Pittsburgh, which was 30,000 and 34,000 sq. ft., respectively.

The announcement also states that because of change in plans a classification of exhibits will not be made until July 15th, but anyone who may find it quite necessary to know approximately what their space arrangements are going to be before that time may find out by communicating with the secretary.

The secretary is now mailing nearly 2,000 of the 96-page prospectus which was mentioned in THE METAL INDUSTRY for June and it is expected that this will result in many applications from new firms in consideration of which fact a warning is sounded to former exhibitors that they had not better lose any time in getting in their application for next fall.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Robert W. Hunt, New York; Secretary-Treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The Society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

As noted in the June issue of THE METAL INDUSTRY this society held its sixteenth annual meeting at Atlantic City, N. J., June 24 to 28. The meeting was divided up into 10 sessions which were held in the morning and afternoons of the successive days and closed on Saturday, June 28.

The ninth session held Friday, June 27, 3 p. m., was extremely interesting. The report of Committee B-1 on Standard Specifications of Copper Wire, J. A. Capp, chairman, was read and by unanimous vote was set down for letter ballot by members for its adoption. The report of Committee B-2, Non-Ferrous Metals and Alloys, Wm. Campbell, chairman, was not completed and so progress only was reported by this committee.

It is interesting to know in this connection that Dr. Stratton, of the U. S. Bureau of Standards, at Washington, D. C., has invited the chairmen of the various sub-committees of Committee B-2, together with the executive committee of the American Institute of Metals, to meet him at Washington in September, probably the 19th, in order to devise methods of procedure for the taking of standard samples for testing of materials.

Papers on the Metallographic Study of Lead-Tin-Antimony-Alloys, by William Campbell; The Study of Bearing Metals and Methods of Testing, by T. D. Lynch (published in this number), and The Strength of Cast-Zinc Spelter, by George C. Stone, which were read at the meeting were very interesting and created considerable valuable discussion which will be reproduced in the proceedings of the society.

The meeting, as a whole, was successful and showed a great interest in the work of the society. Three hundred and sixty members were registered, together with eighty-four ladies, for the entertainment of whom generous provisions had been made.

AMERICAN ELECTRO-PLATERS' SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, Geo. B. Hogaboom, New York; Secretary, F. C. Clement, 462 North 50th St., Philadelphia, Pa. All correspondence should be addressed to the Secretary. The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held the first week in June, 1914, at Chicago, Ill. The branch associations hold monthly and semi-monthly meetings in their various cities.

The first monthly meeting of the New York branch of the American Electro-Platers' Society was held at their rooms, 309 West Twenty-third street, June 27. Six new members were elected to active membership. The new constitution of the society was ratified by a unanimous vote. A discussion was had relating to the pickling or not pickling of stove castings before nickeling. The subject will be taken up again at the next meeting. A committee was appointed to make arrangements for a shore dinner to be held in August. Mr. Walters, a member from Richmond, Va., was introduced and gave an interesting talk on the progress of the society.

The regular semi-monthly meeting of the Newark branch of the American Electro-Platers' Society was held at Newark, N. J., Friday evening, June 20. There was a large attendance in spite of one of the largest storms we have had this summer. Many members of the New York branch were present and there were some very interesting discussions on nickel and silver solutions.

The regular monthly meeting of the Philadelphia branch was held Thursday, June 27. Change of meeting night was laid over to the July meeting. The constitution and the by-laws of the supreme body were adopted and the newly elected officers were installed. President A. B. Wells tendered to the retiring president, F. C. Clement, the thanks of the association for his untiring work in behalf of the association.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December.

Commissioner Wm. M. Webster reports that the summer meeting of the National Association of Brass Manufacturers was held at the Hollenden Hotel, Cleveland, Ohio, June 10 and 11 and was well attended.

Routine business transacted: New members elected and the following resolution adopted, pertaining to parcel post and express charges now universally deducted from the producers' or sellers' bills because "it is allowed by your competitor:"

"Resolved: That all members pledge themselves to charge and use their best efforts to collect, stamp and express charges incurred in small shipments made by mail, express or parcel post."

The meeting passed suitable resolutions in reference to the passing on of our late member, R. H. Mitchell, of the Sanitary Company of America, Philadelphia, Pa., and adjourned to meet at Niagara Falls, Canada, on September 16 and 17, at which time a special invitation is to be sent to all Canadian manufacturers, non-members.

TRADE PRESS CONVENTION

President H. M. Swetland, of the Federation of Trade Press Associations in the United States has announced that the eighth annual convention will be held at the Hotel Astor, New York, September 18 to 20, 1913. The Federation includes the New York Trade Press Association, the New England Trade Press Association, the Chicago Trade Press Association, the St. Louis-Southwestern Trade Press Association, the Philadelphia Trade Press Association and a number of unaffiliated publications, the total membership being two hundred and thirty-six, representing over seventy-five different trades, industries and professions.

President Swetland has appointed as chairman of the Committee on Arrangements, William H. Ukers, editor of the Tea and Coffee Trade Journal, who, as president of the Grocery & Allied Trade Press of America, was largely responsible for the highly successful grocery trade press convention held at the Hotel McAlpin, New York, last January. Mr. Ukers is arranging a programme for the Federation convention which will provide papers and addresses on topics of interest to manufacturers, sales managers and advertising men, as well as to trade paper editors.

ITEMS OF INTEREST TO THE INDIVIDUAL.

EDWIN W. RICE, Jr.

Edwin Wilbur Rice, Jr., who has just been elected president of the General Electric Company, has for long been closely identified with the phenomenal growth of that great corporation, and his personal history can, to a large extent, be read in the continual expansion of its manufacturing facilities and indeed of the whole electrical art. He was born in La Crosse, Wis., fifty-one years ago.

Mr. Rice's work as an electrical engineer began in 1880, immediately upon his graduation from the Central High School of Philadelphia, when he became associated with Professor Elihu Thomson in the early development of arc light generators at the works of the American Electric Company in New Britain, Conn. In 1862, the name of the company was changed to Thomson-Houston Company, and the factory removed to Lynn, Mass., where he was actively identified with the further development of the Thomson-Houston system, and was made superintendent of the company in 1884. Thereafter, he was the technical director in charge of manufacturing. Shortly after the consolidation of the Thomson-Houston and Edison General Electric companies, under the name of the General Electric Company, he was promoted to be chief engineer of the new enterprise, and in 1896 became third vice-president of the company, assuming at that time responsible charge of its numerous engineering and manufacturing departments. In 1903 he became a member of the Board of Directors of the company.

Mr. Rice received the honorary degree of A. M. from Harvard University in 1903, and in 1906 was made Sc. D. by Union College, Schenectady. At the close of the Paris exposition in 1900, he was made a chevalier of the Legion of Honor. He is a Fellow of the A. I. E. E., and member of the American Association for the Advancement of Science. He is also a member of the Institution of Civil Engineers, and of the Institution of Electrical Engineers of Great Britain; of the Engineers' and University Clubs of New York, the University Club of Boston, and the Pilgrims.

P. W. Blair has now entered upon his duties as foreman of the brass finishing department of the Mueller Manufacturing Company at the Sarnia, Ontario, branch.

Henry R. Towne, president of the Yale & Towne Manufacturing Company, has been elected for the sixth time as president of the Merchants' Association of New York.

John A. Logan, formerly foreman of the brass foundry of the National Cash Register Company, Dayton, O., has now become connected in the same capacity with the Delco Brass Foundry, 125 Bayard street, Dayton, Ohio.

Henry Wiesner, who for the past five years has had charge of the polishing and plating departments of the Atlantic Electric Company, of Norfolk, Va., is now foreman plater for the Royal Silver Manufacturing Company, of the same city.

Frank Powers, now in the employ of the H. Mueller Mfg. Company, manufacturers of high-grade plumbers brass goods, Decatur, Illinois, has accepted the position of foreman of the polishing, buffing and nickel-plating departments of the same company in their new plant, now in operation, at Sarnia, Ontario.

George Hills announces that he has resigned his position as manager of the welding department of the C & C Electric & Manufacturing Company, Garwood, N. J., and after this date will be associated with the Electric Welding Materials Company, of 149 Broadway, New York.

Dr. Edward G. Acheson, Niagara Falls, N. Y., while visiting St. Petersburg, Russia, for the purpose of addressing the Russian Imperial Technological Institute on the nature and use of his lubricant, was presented by the Czar of Russia with the insigna and sash of the Order of St. Anne. The decoration was conferred by Premier Kokovtsoff at the American Embassy, St. Petersburg, at a dinner given in honor of Dr. Acheson.

R. M. Fotheringham, 49 Spencer avenue, Toronto, Ont., is now representing the Automatic Buffing Machine Company, 57 Indiana street, Buffalo, N. Y., manufacturers of the well known automatic machinery for buffing shapes such as automobile lamp parts, short tubing, teapot bodies and kettle breasts, bedstead trimming, gongs, flanges and similar articles.

DEATHS

SAMUEL L. MOYER

Samuel L. Moyer, first vice-president of the Lunkenheimer Company, Cincinnati, Ohio, died at his home in that city May 3d. Mr. Moyer was born in Cincinnati, August 17, 1874, and after attending the public schools of the city he was graduated from Woodward High School, from which he went directly to the works of the Lunkenheimer Company and worked his way up to the management.

Mr. Moyer was an active and leading member of the National Metal Trades Association and in this connection was widely known to people in all parts of the United States and Canada. He was also prominently identified with the American Society of Mechanical Engineers. He was also a member of the Queen City Club, the Business Men's Club, the Cuvier Press Club and other organizations in Cincinnati. Mr. Moyer leaves his wife, to whom he had been married only five years, his mother and his sister, Mrs. R. D. Stoner, who are his only relatives.

E. Thomas Cooke, former president of the Ohio Brass Company, Mansfield, Ohio, died at his home in Chicago on June 19. Mr. Cooke, who was seventy-three years of age, came to Mansfield more than thirty years ago from Pittsburgh and established a plant known as the Mansfield Plating Works in the building on North Main street, later occupied by the Central Fruit Company. Afterward he took an active interest in the organization and development of the Ohio Brass Company and was for seventeen years president of that concern. Mr. Cooke is survived by his wife and four children, three sons, L. L., T. G. and B. W. Cooke, and one daughter, Miss Grace Cooke, all of Chicago.

Charles Herbert Tucker, president of the American Ring Company, Waterbury, Conn., died on May 14. Mr. Tucker was president of the above concern from January, 1901 until the time of his death and was also from April, 1909 to February, 1910, president of the Plume & Atwood Manufacturing Company.

The Damascus Bronze Company, of Pittsburgh, Pa., have lost their vice-president and general manager, John T. Brown, who was very well known throughout the metal trades of the United States. THE METAL INDUSTRY in a later issue hopes to publish a portrait and obituary.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

BRIDGEPORT, CONN.

JUNE 30, 1913.

Business conditions in Bridgeport seem to be exceedingly good considering the season. There is a slight tendency toward dullness in some lines, but these same factories are the ones which have been running overtime for some time past, and now to get back to regular hours gives rise to the statement that a slight lull has reached them. There are other factories who are receiving the usual amount of orders, and not a single factory has announced a shortening of hours. These facts are taken as indications that business is good despite some statements to the contrary. The Blue Ribbon Auto & Carriage Company who were planning some months ago to build a new plant to take care of their growing business, have taken over the modern factory building of the Bellmore Armored Car & Equipment Company, whose affairs have been in the hands of a receiver for some time.

The Coe-Stapley Manufacturing Company, manufacturers of brass goods, are still involved in trouble with the employes who are striking for shorter hours. The factory is operating with strike breakers, and the company are thus able to take care of their business. Other manufacturers are deeply interested in the outcome of this strike, because if shorter hours are granted they too will have to make the same concessions. On the other hand the strikers threaten that unless the company gives in a general strike will be called which would tie up many industries here.

The Bridgeport branch of the Max Gordon & Son Corp., of Housatonic avenue, was totally destroyed by fire on the afternoon of June 15. The loss is estimated at $15,000. The Canfield Rubber Company, and the Housatonic Machine Tool Company adjoining, were also badly damaged. Crane Valve Company, the largest manufacturers of valve fittings in the East, are to open permanent show rooms in the new Poli building. The exhibit will include bath-room fixtures in all latest designs.

Rumors are afloat to the effect that the National Cash Register Company, of Dayton, Ohio, is again looking for a factory site in this city, with a view to moving their business here. It will be remembered a similar move was contemplated about three years ago. Inquiry at the Board of Trade, however, failed to confirm these rumors. Six other factories are looking for factory sites in this city, but as nothing definite has been settled the names could not be learned. The Electric Cable Company announce that they have recently received orders enough for insulated wire to keep the factory running full time for many months.—L.

PROVIDENCE, R. I.

JUNE 30, 1913.

The close of the first six months of 1913 finds the majority of concerns of this city and vicinity engaged in the various metal industries, well satisfied with the conditions as to the past, but somewhat unsettled as to the future. The six months has been one of considerable speculation, the uncertainty concerning the results of tariff agitations keeping manufacturers guessing and on the anxious seat. The first half of the year, however, made a better showing than had been anticipated, in consequence of which there was a corresponding degree of satisfaction.

Among the various foundries business has been fairly good all the year and reports indicate a generous business during the concluding six months. At the bronze foundry of the Gorham Manufacturing Company's plant there are more orders on the books than can be cleaned up in nearly two years and more are being constantly received. One of the handsomest pieces recently turned out by this concern is "The Whaler" that was dedicated a few days ago at New Bedford. It is said to be one of the finest pieces of heroic bronze in the country and is one of a number of similar character that are being finished at the Elmwood works of the company.

Brass foundries have had a better season than in several years because of the large number of orders from the flood sections of the West and many of these are now just beginning to slacken off. With the manufacturing jewelers and the kindred and allied trades business has been only fair, several reasons combining to bring about the general conditions now prevailing. The tariff agitation first gave the jewelers an alarm, then came the slump attendant upon the invasion of the buyers followed by the meeting in this city of the convention of the National Wholesale Jewelers' Association. Then came the passage of the 54-hour law which debars the employment of women and children more than 54 hours in any week and not more than ten hours in any one day. Then to cap the whole situation came the investigation by the Federal authorities of the alleged combination be-

tween the National Association of Manufacturing Jewelers and the National Wholesale Jewelers' Association, in restraint of trade. In the latter connection a number of the manufacturing jewelers of this city and the Attleboros have been summoned to New York to give their testimony before the Federal grand jury and what the outcome will be it is impossible to conjecture at this time.—W. H. M.

ATTLEBORO, MASS.

JUNE 30, 1913.

The coming of July finds the jewelry trade in a hopeful rather than a hopeless condition. Not many men in any line are found stocking up beyond their immediate wants, and the jobbers are sharing in the general hesitation. The salesmen are sending back orders which are about the average for this time of year and are predicting that the fall looks good. Back at the factories preparations are being made for a big rush later and the annual vacations this month are part of the plan. The tariff is not so much of a disturbing element as was first feared. The manufacturers of silver novelties which are better protected by the more clear-cut definitions that are used see much good in it. The duty of 85 per cent. in the present law is cut to 60 per cent., but the trade is satisfied that in the explicit definitions that are given it will prosper. The senate committee did not change a rate, but it did make even stronger the definition of "imitation jewelry." For this reason, among others, the jewelers are awaiting the autumn with confidence.

A striking sidelight on the present situation is that the Mason Box Company at the Falls has abandoned plans for its annual shop outing owing to the amount of business on hand. The firm's product is largely used in the jewelry trade.—C. C. C.

BOSTON, MASS.

JUNE 30, 1913.

Reports on metal trade conditions in Boston lack uniformity. It is apparent, however, that in many directions business is slowing down, whatever may be the experience of individual concerns regarding the comparative volume of orders.

The larger wholesalers continue to make heavy deliveries on old orders, and have been busy throughout the first half of the year endeavoring to catch up with the requirements of their customers. A representative house of this sort, Richards & Company, states that "business keeps up remarkably well, but it is mainly on the momentum of earlier contracts and orders, while new business is less in quantity, if no less urgent, with prospects for a still further restriction through the summer."

There is no special metal which can be singled out as stronger and more active than others at present, in comparison with its usual status at this period of the year. While the outlook for wholesale lines is not wholly optimistic, current output does not admit of dissatisfaction with the aggregate deliveries of stock.

Manufacturers who do jobbing work in general lines, and whose production, as a rule, is of a character requiring a quick response to orders, find business rather slow. Scrannage Bros. report a little increase during the latter part of June, but a tendency toward slackness for July and August requirements, judging by the general attitude of customers.

Some of the apparent drift toward less energetic soliciting of new business which is discernible throughout the trade, and which has affected the tone of business for the past three or four months, is attributed to labor conditions and the uncertainty attendant upon labor unrest.

There have been strikes in the metal industries, as well as in other branches of trade, here in Boston, although no disturbances are in existence just at present. One employer, however, expresses the feeling of all very tersely in saying: "We do not know when we estimate on a contract, or even on a lesser job, whether we shall be able to complete it on time or within the estimate, because the labor element is so indefinite and uncertain." This phase of the matter is quite as disturbing as the tariff agitation, possibly more so.

Among the silver and nickel platers and the lacquer finishers business is not extremely active, but the Boston Nickel Plating Company regards it as equal to the normal amount for June and seasonably good on the whole.

At a few establishments the June report is better than that for May or April. This may perhaps be accounted for on the ground that orders deferred from earlier in the season, by reason of extra caution that was due to tariff agitation, it has been found necessary to place, after all, because of cumulative consuming requirements.

Herman Strater and Sons, for instance, who usually find April and May business heavier, foot up an unusually good June output, better than the earlier period, this year. Braman, Dow and Company, whose products are disposed of largely in the building trades, report an excellent June demand and the last week of the month was especially heavy.

Among the chandelier and lighting fixtures manufacturers the mid-summer business holds up in good volume also, with a general expectation, however, of some decrease in new business during the last half of the year. This latter feature is a condition that obtains in the jewelry industry to some extent.

In fact it may be stated as the consensus of opinion in various lines of metal working that the ensuing six months do not give promise of as much activity as the past six months have yielded. There is beginning to appear an appreciable lack of steadiness and sustained continuity in demand, which is considered indicative of probable decrease in volume of business. Whether it is justified or not, nobody will attempt to decide, while tariff legislation is pending.—J. S. B.

MERIDEN, CONN.

JUNE 30, 1913.

It has been said that the summer vacation period is the business barometer of our local factories, the length of the shut down indicating the condition of business. This will not hold good in all cases, for in some factories it has been the custom to close only for one day, namely the Fourth of July, while others have for years shut down their plants for two weeks. This would not mean that business in the first plant was exceptionally good and in the other poor, but would mean that it had been the custom of the company to close the factory for two weeks and their employees would be disappointed if they did not have the vacation at this time. If the statement is true that a long shut down means that business is in an unhealthy condition and a short one would indicate a flourishing condition then Meriden is to be congratulated for the vacation period in no case will be longer than it has been in past years when business has been considered to be good. The brass factories have been especially fortunate, business having been for the first six months fully as good, if not better, than last year.

The factories manufacturing silverware have not been as busy as they have in some years in the past, but the fact that they have gotten out a large line of samples would show that they are optimistic in their view of the fall trade. The desirability of our city as a location for manufactures is becoming more and more evident, two concerns have opened negotiations with our Board of Trade for sites here and it is expected that they will locate here early in the fall. The Aeolian Company are having some difficulty with their employees over piece work prices but they look forward to an early settlement which will be satisfactory to both sides. This seems to be the only labor cloud in the business sky at present.—F. O. V.

NEWARK, N. J.

JUNE 30, 1913.

Business is quiet now in all lines due to tariff agitation, curtailment of production and buying and the summer period is always more or less dull. All the jewelry, silverware and metal concerns will close up their factories for two weeks this month, in order to take the usual vacations and make repairs. Schless, Brod and Company, specializing in emblems, will enlarge their factory and take the basement so as to increase the output.

The Jones & Woodland Company, jewelry manufacturers, have bought the building they occupy with other firms at Railroad avenue and Garden street. The Balbach Smelting & Refining Company have erected a steel melting furnace at a cost of $5,000. They have made a number of improvements during the past few years.

Baker & Co., refiners and smelters of gold, silver and platinum,

are building a three-story concrete factory as an addition to the present plant at Mulberry and Austin streets, to cost $73,000. J. A. Granbery, late of J. A. and S. W. Granbery, has left that firm and joined with Gibson, Krugler and Company, the name now being Gibson-Krugler-Granbery Company, at 306 Market street. They have incorporated for $60,000. F. R. Krugler is president; F. S. Gibson, secretary; J. A. Granbery, treasurer. The Electrolytic Art Metal Company, of Trenton, are now making silver deposit work on cut glass, instead of on plain glass. They gave up their Chicago office. The firm have reorganized with F. Crane, president; Stanley Wilcox, vice-president and general manager; F. R. Brace, secretary and counsel.

The Goldsmith-Koch Company have given up the manufacture of mesh bag link for the trade and are now making the complete patented sterling and German silver mesh bag. They have taken two buildings in the rear of 105 Oliver street, have much larger space and better facilities. The Nassau Lighter Company, who started a very good factory in the Rosenbaum building, making gold and silver cigar lighters and novelties, had 60 hands working and were doing a nice business. After about a year in business they have now quit. George H. Greenhalge was superintendent. The office was at East Twenty-third street, New York City.

John Levins, who was with McFarland Bros., of Bridgeport, Conn., is now foreman of the casting department of the Elite Novelty Company of Newark. Fred Pritchard, who was foreman plater for Benzinger Bros. of New York, is now foreman plater for the same concern.—H. S.

NEW BRITAIN, CONN.

JUNE 30, 1913.

Another whack at the tariff that will vitally affect the manufacturers of New Britain has been handed out by Congress in the passage of the bill that practically sweeps away all of the tariff on screws. This will greatly affect the Corbin Screw corporation of the American Hardware corporation, New Britain's greatest manufacturing industry. In an interview on this matter former congressman Ebenezer J. Hill said that the act of Congress in reducing the tariff on screws from forty-five to five per cent. will, in his opinion, affect the local industry to a great extent. Mr. Hill was in Washington on the night Congress passed this bill and he said the House of Representatives voted to reduce this tariff from forty-five to twenty-five per cent. and Congressman Reilly, of Meriden, offered an amendment replacing the tariff at forty-five per cent. which was defeated. When the bill was sent to the Senate that body again used the pruning knife, reducing the tariff by twenty per cent., making it only five per cent.

Isaac D. Russell, assistant treasurer of the American Hardware Corporation, spent some time in Washington this month and had several conferences with Senator McLean concerning the tariff. He represented hardware interests in New Britain and is in favor of maintaining the present rates. On July 1 Henry C. M. Thompson, of New York, took the reins of the large corporation into his hands as president in place of Colonel Charles M. Jarvis, resigned.

The heads of the P. & F. Corbin branch of the corporation assert that there is no cause for worry over working conditions and say their business is on a par with other years. Manager Charles Parsons told a METAL INDUSTRY correspondent that his factory has work enough. He said "There is no danger of our shutting down, we've got orders enough coming in every day." Although from the office the business seems good it is somewhat slower in the factory and during the latter part of June about 100 employees of this division were laid off. The officials say "it is just the usual summer slump and is nothing unusual."

That business in all departments of the P. & F. division is not as brisk as a few months ago is obvious for at about the time the present administration came into power the door check department was so rushed with work that a night and day shift of men were employed. At present this section of the factory is working but fifty hours per week. The wrought brass butt department is now working but forty hours a week and the foundry but fifty hours. This is a decrease as the rest of the division is working the regular fifty-five hour schedule.

Business is apparently good at the Landers, Frary & Clark concern, cutlery manufacturers, for they have recently applied to the city for a permit to build an addition to their plant which will cost about $20,000. On the whole manufacturing conditions in this commercial manufacturing center seem to be about the same as usual and aside from the uncertainty with which the high officials of the various plants gaze at the tariff question there is nothing alarming in the situation.—H. R. J.

READING, PA.

JUNE 30, 1913.

Reading is getting in the 100,000 population class and is moving along steadily in a prosperous way. It is a big manufacturing place and is growing. As a manufacturing center for metal goods it is prominent and the lines are growing more varied. There is considerable gold, silver and German silver work here as well as brass, bronze, aluminum, etc.

The Standard Company has been taken under management by A. S. Deysher. The company expect to ship this year over 4,000 motorcycles and at the present time are ahead of their schedule. Have a good plating plant and are erecting a new nickel plating plant in the new building, in charge of Charles Harbster. The new building has doubled the capacity of the factory.

The Penn Hardware Company are running full time and are exporting to Australia, England and Germany. Before this they made the cheaper lines of hardware, but are now making the better grades and increased these lines 200 per cent., and are expecting to make that a large part of their product. They expect to take advantage of the Panama canal and reap some benefit and will have an exhibit at the World's Fair in San Francisco. The demand has swung from old copper to dull brass, relieved finish designs, from the heavy ornamental to the very plain. Two years ago the plain Grecian and Colonial designs would only sell in Philadelphia, but now the whole country demands these designs and finishes. They have an agency in South Africa at Cape Town, in charge of the New York office. They think the tariff will not affect them and may be a benefit in buying raw materials. The hardware that their trade demands they say is not made abroad.

The Light Manufacturing Company, of Pottstown, Pa., making aluminum automobile castings, have had a strike on now for about a year. The Keystone Multiple Parts Company have started in business at Hamburg, Pa., manufacturing brass nipples. They have built a new plant in charge of Jay L. Wells. The Hamburg (Pa.) Piano Company are building a new factory and will put in a plating plant. This is a new firm, in charge of Mr. Packingham. The metal crafters are building a factory at Stroudsburg, Pa., to make plumbing specialties. The Reading Hardware Company report business quiet, are short of hands and have had a strike at their plant for months. The plant is not running full time. Some improvements have been made. The Crescent Brass Manufacturing Company are building a fireproof addition to their plant at a cost of $1,500. The Keystone Gas & Electric Fixture Company have twelve men at work, making chandeliers, gas and electric fixtures and have a plating plant. Most all the fixtures are made of brush brass finish. Earl Urban, who was with the Mooreau Gas Fixture Company, of Cleveland, is their new designer. W. F. Price, of W. F. Price & Son, who made chandelier fixtures at Boyer Heights, has gone out of business and is now selling automobiles.

The Reading Hardware Company elected the following officers: President, Lambert A. Rehr; secretary and treasurer, S. Y. Reigner; superintendent, W. H. DeWolfe. It is proposed to issue a mortgage of $250,000. It is said the plant is to be enlarged.

The Howard Metal Company, of Second and Canal streets, have been very busy making brass and aluminum castings, and have enough orders on hand to last for a year ahead. These are for automobiles mainly. The melting capacity will be increased by a new oil furnace. A new brick and steel building is to be erected, 40 x 150 feet in size, to cost $25,000. A compressed air molding machine will be put in and they are considering adding a cupola for gray iron castings. Their aluminum is imported from England, France and Germany, as they cannot get any in this country owing to the aluminum conditions. The demand for aluminum automobile parts is five times what they can supply. Robert P. Fritsch is the general manager; Walter Boyer, late

with the Light Manufacturing Company, of Pottstown, Pa., is the new general foreman; J. Frank Lanning Company, of Pittsburgh, having charge of their sales through the West.

The Wilkes-Barre Metal Drawing and Stamping Company have changed their name to the Pressed Steel Company, and are working in pressing brass, etc. Have a good plating plant to plate copper and brass and also do a jobbing business in plating. Charles Ruggles is in charge of this end. They expect to enlarge the manufacturing end.

Hines & Ritchey, well-known coppersmiths at 1305 West Main street, have been busy during the month, according to T. J. Hines. The firm has supplied the necessary distilling equipment, including worms, vats and larger mash tubs, to double the capacity of a big Arkansas distillery and to increase by 50 per cent. the capacity of a leading Virginia plant. The outlook for coppersmithing in the distilling trade is so bright, notwithstanding the temporarily deleterious effect of the Webb anti-shipping law, that Hines & Ritchey are on the look out for bigger and better quarters, and will move their plant as soon as these accommodations may be secured, said Mr. Hines.—H. S.

COLUMBUS, OHIO

JUNE 30, 1913.

The metal market in Columbus and central Ohio has been ruling quiet in the past month. Most of the metals are off a little in price, although it does not amount to demoralization in the least. Metal buying concerns are inclined to go slow at this time, waiting until after the July 1 inventory period before stocking up to any extent.

One of the chief factors for the quietude is the tariff agitation. A good many metal using concerns are going slow in making their purchases for that reason; they prefer to wait to see what will be done with the tariff before placing their orders and their policy has been to buy only what they need for immediate wants. This had had its effect on the trade in many ways and the present condition is not a surprise to metal dealers. Very few new metal using concerns have started up in Columbus but in some of the smaller cities and towns in the Buckeye State there has been considerable activity in new business which will mean the sale of metals. One of the principal events which is of interest to the industry is the new plant projected and started by the John W. Brown Manufacturing Company, manufacturers of auto bed carriage lamps. This plant will be one of the most modern in the city and will be erected on Marion road.

Copper is weaker and the same is true of lead and zinc. Copper sales are rather slow, although the demand is steady under the circumstances. Copper wire is quoted at 14¼ cents, while Lake Copper is sold at 16¼ cents per pound. Brass is another of the metals which is off to a slight degree. No. 1 red is quoted at $12.75 to $13 per hundred pounds, while yellow brass is sold at $9.50. Aluminum is also quiet but prices have not declined as in other metals. No. 1 scrap is sold around 23 cents. Babbitt metal is selling well in most sections, although the general weakness in the printing business is reflected on the demand for that metal. It is expected that the babbitt market will pick up some after July 1. Generally speaking, the outlook for the future is good and with the tariff agitation out of the way an improvement in all metals is expected.—I. W. L.

LOUISVILLE, KY.

JUNE 30, 1913.

With few exceptions the local members of the metal trades are experiencing a slackening of business which may be attributed either to the more or less normal summer lethargy, or to the fact that tariff legislation is on the program for the immediate future, and general conditions are reflected here. Most of the Louisville plating shops are taking things easily, with one of the hottest Junes ever known running into what promises to be an exceptionally torrid July. The distillery business does not amount to much at present, but the coppersmiths will have plenty to do in this important line before long.

The Standard Sanitary Manufacturing Company is planning to build a one-story enameling house and storage shed at its plant in Louisville, the building to measure 70 by 175 feet, and to cost $19,000. A permit for the building has been taken out, and the architects have completed the plans, although there is said to be some doubt about the completion of the building at the present time, on account of the general dullness prevailing in the business. It is probable, however, that the work will proceed.

Charles Schadt and John Rademaker are making a success of the new Independent Brass Foundry at 437 South Center street in Louisville. The foundry makes castings to any pattern and is enjoying excellent trade. Ahlers & Gregoire, a partnership, have succeeded the old concern of Hoffman, Ahlers & Company in Louisville. Hoffman, Ahlers & Company, a Kentucky corporation, with offices in Covington, will continue to operate extensive copper works which they own in Cincinnati, O., directly across the Ohio river from Covington, but have disposed of the local plant on East Main street to the new firm. George F. Ahlers has disposed of his interests in the Hoffman, Ahlers concern, and Alex A. Gregoire, for thirteen years past general manager of the Louisville plant, has entered into partnership with him in acquiring it. The new firm of coppersmiths has commenced business auspiciously.

Work which has been undertaken by the Standard Sanitary Manufacturing Company, of Louisville, will go still further to support the concern in its contention that not a single case of lead poisoning has occurred among its workmen during its twenty-odd years experience in the local field—the recent story in a national publication to the effect that lead poisoning was prevalent among employees of metal-working establishments to the contrary notwithstanding. The company has secured the services of a trained nurse and has placed her in charge of a hospital provided in the plant. Modern facilities for handling many types of emergency cases are provided, but inasmuch as accidents are rare at the Standard works the greater part of the nurse's duties consists in visiting the families of Standard workmen, administering to their immediate medical needs and suggesting sanitary preventives which may go far toward improving the physical and social status of the hundreds of persons dependent upon the company for employment. The nurse is a regular employee of the Standard interests, and her work has proved to be very effective although only of short duration thus far. Dressing-rooms with individual lockers, shower and tub baths, thoroughly modern toilet facilities and so forth are now being provided by the Standard Sanitary Manufacturing Company at its plant, Sixth and Jarvis streets, and it is the evident intention of the concern to present a model appearance in the physical aspect of its properties as well as in the nature of its products. A recent list of factories and their employees compiled by a large public service corporation in Louisville indicated that the Standard Sanitary Manufacturing Company and the Ahrens & Ott Manufacturing Company, operating in conjunction, figure among the largest single employers of labor in the Gateway City, with a force of approximately 1,200 men.

Constant Georgel, president of the Louisville Silvering & Beveling Company, died recently at his home in Louisville after an illness extending over more than a year, although he had been confined to his bed only a few days. He was one of the founders of the company of which he was president, having started the business in 1886, and brought it to its present prosperity. He was born in Lorraine, France, in 1856, and came to New York in 1873. He had been a resident of Louisville for about thirty-five years. Burial was in Cave Hill Cemetery.

Thomas J. Nichol & Company, brass foundrymen of Cincinnati, O., have purchased a lease on the northeast corner of Plum and McFarland streets in that city, 84 x 132 feet, the lease to run for ten years, at an annual rental of $800, with privilege or purchase at $16,000. There are leases on the property, however, which will prevent its immediate improvement by the brass concern.

The Indiana Brass & Foundry Manufacturing Company has been incorporated at South Bend, Ind., with a capital stock of $10,000, for the purpose of manufacturing various brass products. The directors are Samuel J. Smethers, Teopihl Bednarowicz and Floyd A. Deahl.

The Crabtree Metal Works, of Chattanooga, Tenn., is a new company which has been organized by B. I. Crabtree, A. S. Coffee, D. G. and W. R. Crabtree and Paul Campbell, with a capital stock of $5,000. The company has a building at Main and Fort streets, which it will remodel and equip for its purpose.—G. D. C.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The American Tube Works, Boston, Mass., is erecting a one-story addition to its foundry which will be 67 x 76 feet.

The Pioneer Brass Works, Indianapolis, Ind., report that their new addition is about completed. This company has a brass and aluminum foundry and machine shop.

The Aluminum Company of America, Pittsburgh, Pa., on July 1 opened a branch sales office at Kansas City, Mo., with headquarters at 401 R. A. Long Building, Mr. A. G. Hamilton, Mgr.

The Johnston Harvester Company, of Batavia, New York, for their new grey iron core room, are installing a battery of four units of Reel Type Core Ovens, made by the Quigley Furnace & Foundry Company, Springfield, Mass.

The Galion Brass & Bronze Company, Galion, O., began operation on June 6 at their new factory on East Main street. They only do rough castings, as they have no machining or metal working departments as yet.

Arthur E. Nelson, Brooklyn, N. Y., has purchased a half interest in the United Novelty and Plating Company, Newark, N. Y., from J. A. Harris and the whole establishment has been moved to 9-11 Playstead road, West Medford, Mass.

The Allentown Bronze and Hardware Company, Rittersville, Pa., have finished buildings for their brass foundry, machine shop, plating and polishing rooms and are now installing machinery in the different departments. D. D. Truxler is general manager.

Otto Kramer has established a brass foundry for the production of all kinds of brass, copper and aluminum castings at Milwaukee, Wis. Mr. Kramer is now ready to communicate with metal and composition dealers with a view of forming business connections.

The controlling interest of the Aluminum Foundry Company, of Sebring, O., has been purchased by A. C. Heacock, W. B. Stevenson and John H. Hotchkiss. This company manufactures aluminum hollow ware and does a general jobbing business both in aluminum and iron castings.

The Newell Brass Foundry, Central Falls, R. I., which stood on the same site since 1847, was recently demolished by the Pawtucket and Central Falls Grade Crossing Commission. A larger and better foundry and finishing shop has been built and is now occupied by Fred E. Newell, the son of the founder of the business.

The report published that the Dominion Bronze Manufacturing Company, Ltd., of Preston, Ont., will erect a foundry is erroneous, as this concern has already its own brass foundry, metal working shop, plating room and, in fact, a complete plant for the manufacture of brass goods of all kinds. J. W. Paterson is general manager.

The firm of E. R. Caldwell & Son has been organized at Syracuse, N. Y., and will build and equip a foundry plant for the manufacture of brass, bronze and silver metal castings late this fall or next spring. The temporary foundry of this company is located at 100 N. Geddes street, which has a floor space of 6,500 square feet with modern equipment.

An interesting demonstration of silver Trisalyt was given on July 8, by Wm. Schneider, of the Roessler & Hasslacher Chemical Company, New York, at the Navy Yard, Brooklyn, N. Y. The demonstration was given before officials of the United States Navy, with a view of introducing Trisalyt throughout the naval stations, wherever there is a plating plant where electroplating repair work is done.

The American Bauxite Company has notified the Secretary of State of Arkansas of a reduction of capital stock from $2,000,000 to $1,000,000. The Aluminum Company of America owns 19,900 shares of stock in this company, the balance being owned in this State. The reduction is made on account of the recently passed tax measure, which forces the corporations to pay taxes upon capital stock.

The Newark Sheet Metal Company is establishing a plant at 216 High street, Newark, N. J., to manufacture sheet metal goods of every description. They are soliciting opportunities to quote on contract and job work in stamping, spinning and electroplating, and in fact any kind of sheet metal work. In addition to take contract work they will manufacture a complete line of lamps, lanterns, reflectors, lamp shades and tin and copper ware for household uses.

The Edison Storage Battery Company, Orange, N. J., for its new building, now being erected for the manufacture of storage batteries, has placed through the New York office of the Quigley Furnace & Foundry Company, Springfield, Mass., one of the largest contracts for Accurate Temperature Furnaces ever placed. This contract is for fifty-nine of the Quigley Patent Overfired Accurate Temperature Furnaces burning oil fuel.

The Wayne Brass Foundry Company, Pittsburgh, Pa., expect to be in their new plant located on Butler street, between Forty-sixth and Forty-seventh streets, on or about July 1. This company began business at their present location, 134 Home street, a little more than six years ago, and, having outgrown their present building's capacity, purchased the property on Butler street, on which they have erected an up-to-date foundry in which they expect to more than double their output in all kinds of brass and aluminum castings.

The Indianapolis Aluminum Casting Company has begun operating its new plant at Fulton and Walnut streets, Indianapolis, Ind. The foundry, which is the only one of its kind in Indianapolis, is well equipped and will be a time saver for local automobile manufacturers who have heretofore been obliged to purchase their aluminum castings at Cleveland and Detroit. The company is capitalized at $50,000 and Fred Holloweg is the president and treasurer. The company, when under full operation, expects to employ sixty-five skilled workmen and will have a capacity of 8,000 pounds of aluminum castings a day.

It is reported that the extensive operations which the Aluminum Company of America have on the way for the establishment of an aluminum plant at Knoxville, Tenn., are resting in the balance pending the settlement of the new tariff rate on aluminum. Should the rate fixed be considered reasonable by the aluminum interests the million dollar plant will be established at Knoxville, but should the tariff be so revised as to preclude large profits in the estimation of the Aluminum Company a plant which had been designed for Maryville would be abandoned. The Aluminum officials are now conferring with the city authorities of the two places mentioned.

The Graphite Metallizing Corporation, of Yonkers, N. Y., report that they are now building a plant and will be ready for business in the fall. This company proposes to employ a process which consists of the impregnation of graphite with various metals for various purposes. The field of the material is two-fold, being used both electrically and mechanically. For electrical purposes it will be employed in the form of graphite brushes impregnated with copper for slip ring rotary converters, plating dynamos and other low voltage direct current machines. In the mechanical field it will be used as self-lubricating bushings impregnated with babbitt or bronze and these bushings are adaptable for light duty machinery where the use of oil is objectionable. This company is composed of Alexander Turner, president; F. P. Fuller, vice-president, and Wm. B. Given, Jr., treasurer.

The Aluminum Goods Company, Two Rivers, Wis., have started work on additions to their plant which will make it the largest of its kind in the world. The main building which will be erected west of the old building will be 44 x 370 feet in size and three stories high. This building will be fireproof construction and will be built entirely of steel, brick and concrete. The building will have two wings, one on the north and one on the south ends, both extending eastward. The old wooden building which is now used as a buffing department will be torn down and one of the wings of the new building will cover the ground. The main building will be utilized for manufacturing purposes and a modern rolling mill is to be located in the south wing. A separate building of large proportions will be erected for the boiler room and power house. The company also has plans for the improvement of the present buildings.

GOVERNMENT WANTS

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., July 29, 1913, and publicly opened immediately thereafter, to furnish at the navy yard, Puget Sound, Wash., a quantity of naval supplies as follows: Sch. 5608: Brass voice tubing.—Sch. 5610: Composition tubing, composition unions.—Sch. 5620: Composition safety treads. Also to furnish at the navy yard, Mare Island, Cal., etc., a quantity of naval supplies, as follows: Sch. 5608: Brass and copper wire.—Sch. 5609: Phosphor and manganese bronze, rod and sheet brass, rod and sheet copper.—Sch. 5610; Brass pipe, copper pipe and tubing, composition pipe fittings. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, Seattle, Wash., San Francisco, Cal., or to the Bureau.

T. J. Cowie,
Paymaster General, U. S. N.

REMOVALS

Robt. Lee & Company, gilders and colorers, formerly located at 13 Franklin street, Newark, N. J., have moved to Chestnut and Mulberry streets.

R. F. Lang, importer of the Royal brand of prepared nickel salts, Royal manganese and phosphor copper, phosphor tin and silicon copper, has moved his office from 31 and 33 Broadway to 8 and 10 Bridge street, New York.

The John J. Jackson Company has moved from 91 Mechanic street to 156-158 Astor street, Newark, N. J. This company manufactures fireless sterling silver, silver anodes, wire, solder, granulated silver and pure shot copper. They also refine sweeps and make silver chloride and nitrate.

The Dover Laboratory, of Dover, N. J., Ethelbert Ely, proprietor, has been moved from Randolph avenue to 53 East McFarland street of the same town. This laboratory executes analyses, assays and sampling of all kinds of materials relating to metallurgical processes.

The Alpha Alcohol Utensil Company, formerly located at 109 Hamilton street, Newark, N. J., have moved to better quarters at Hamilton and McWhorter streets. The Alpha company make a specialty of alcohol stoves and self-heating alcohol irons and, in addition to nickel plating their own Vacuum Company, who are located in the same building.

Owing to the increasing business in the Cleveland office, The Bennett-O'Connell Company find it necessary to move to larger quarters. They are now located at 5200 Euclid avenue, where they are in much better position to handle more business and execute orders promptly. Their new location puts them right in the heart of the manufacturing district.

Joseph Landsman, who has been carrying on at Maiden Lane a plating, repairing and special order jewelry business for the past ten years, has now moved into his new factory at Newark, N. J. This factory is a modern three-story building of yellow brick trimmed with red brick and sand stone, and is 35 by 85 feet deep. The second and third floors have been given over to repairing, special order work and gold, silver and platinum plating, while the firm's offices will be located on the second floor and the ground floor will be occupied by the receiving and shipping departments.

INCORPORATIONS

L. Fritsche & Company, Newark, N. J., Capital $100,000. To manufacture watches, jewelry, etc., Incorporators, L. Fritsche, Frederick Thaler and R. Thaler.

The O'Hara Waltham Dial Company, Waltham, Mass. Capital $40,000. Incorporators, A. Lyman, president; C. F. Stone, treasurer; and C. F. French, secretary.

The Art Foundry Guild, Inc., New York. Capital, $100,000. Metal founders. Incorporators: A. B. Gwathemy, W. B. Lightfoot and William Mitchell, all of New York.

The Charles Hoppe Company, Cincinnati, Ohio. Capital, $15,000. To manufacture castings in all metals. Incorporators: Charles Hoppe, C. E. Fisher, A. I. Murdock, Philip Gankel and Ida M. Gankel, all of Cincinnati.

Atlas Die Casting Company, Inc., Syracuse, N. Y. Capital, $10,000. To manufacture bronze and aluminum castings. Incorporators: Frank R. Holmes, Morey S. Smith and S. G. Schlachter, all of Syracuse.

Experimental Machine and Die Company, Inc., New York. Capital, $50,000. To manufacture machinery, hardware and tools. Incorporators: F. M. and W. A. Condon, of Manhattan, and L. M. Petrucelli, of Brooklyn.

William H. Otto Metal Goods Corporation, Jersey City, N. J., manufacturers of metal specialties, finished castings, and special machinery. Capital, $100,000. Incorporators: Wm. H. Otto, J. Steinhauer, Jersey City, and H. M. Otto, Brooklyn, N. Y.

Union Plate & Wire Company, Attleboro, Mass. Capital $50,000. To manufacture rolled gold, plated flat stock, tubing, seamless wire, etc. Incorporators, A. S. Blackinton, president; David Low, vice-president, and F. C. Willmarth, treasurer.

Stumpf Jewelry Company, Chicago, Ill., Capital $10,000. To manufacture and deal in watches, jewelry, silverware, etc. Incorporators, A. H. Stumpf, A. M. Bowers, F. W. Zimmerman and Otto Stumpf, formerly with Otto Stumpf & Co., will be general manager.

The H. W. Burdick Company, Cleveland, Ohio, Capital $50,000. Wholesale jewelry. Incorporators, H. W. Burdick, C. F. Groth and Wm. H. Cool. Directors, H. W. Burdick, president and treasurer; H. E. Burdick, vice-president; C. F. Groth, secretary; S. A. Burdick and A. T. Hills.

The Delaware Brass & Aluminum Company, Muncie, Ind., recently filed articles of incorporation with the county recorder. The company is incorporated at $10,000 and consists of 200 shares. The company will build their own factory building, 60 x 80 feet, at the corner of Twentieth and Walnut streets and expects to occupy it by the middle of July. Their entire output will consist of brass and aluminum castings. The incorporating members are John Beckett, Patrick J. Casey, Charles Beckett and Charles Bowers, all of Muncie, and R. George Simmons, of Anderson, Ind.

The Drew Electric Company, Indianapolis, Ind., was incorporated April 15, by James H. Drew and others to do an

electric railway, gas, light and power materials manufacturing business. The company has taken over by purchase and proper transfer all the stock, machinery, etc., of the business formerly carried on by the Indianapolis Brass Company.

PRINTED MATTER

Mineral Cleaner.—The Electric Smelting and Aluminum Company, of Lockport, N. Y., talk interestingly about their mineral cleaner, what it does, how to use it and who uses it in a little booklet just issued, which may be had free upon request.

Speed Regulator.—A valuable speed jack shaft which enables the machinist to feel for and maintain the extra operating speed required to insure producing the maximum profit from the machine is described in a four-page folder issued by the S. & S. Variable Speed Gear Company, 50 Church street, New York.

Formastat.—A new rustless coating for iron and steel, metal and wood work, is described in a twelve-page folder just issued by the Formastat Mining Company, St. Louis, Mo. It is stated that Formastat may be used to reduce the price of aluminum, gold, copper and brass powders, while the lustre remains practically the same.

Foundry Sands.—Whitehead Brothers Company, New York, have issued an interesting catalog relating to foundry sands, clays and gravels. A complete description is given of the various grades of sand produced by this company and also the uses for which these grades are particularly adapted. The catalog will be sent upon request.

Crucibles.—A plain talk about crucibles is given in a little booklet issued by the Bay State Crucible Company, Taunton, Mass. A good deal of valuable information is given in this little booklet and it would be well worth the time spent by any crucible user to study the same. The company will be glad to send copies to anyone interested.

Graphite for the Boiler.—The Joseph Dixon Crucible Company, Jersey City, N. J., have just published a new booklet under the above title. The booklet gives a lot of information relating to the use of graphite on boilers, tells how to use this material and prevent the formation of scales which usually causes so much trouble in the steam plant. Copies of the booklet will be sent upon request.

Pyrometers.—Hoskins thermo-electric pyrometers, manufactured by the Hoskins Manufacturing Co., of Detroit, Mich., are described in bulletin No. 3, recently issued by this company. The work contains full information relating to the line of electric pyrometers manufactured by this concern and instructions are also given for the proper application of the instruments. Copies may be had on request.

Eye Protectors and Respirators.—The American Thermoware Company, 16 Warren street, New York, have issued a catalog of eye protectors and respirators for the use of industrial workers. Tests made recently in some large metal plants showed that after the adoption of eye protectors and other safety devices the number of accidents was greatly reduced. The catalog fully describing these products will be sent free on request.

Graphite Brushes.—The Joseph Dixon Crucible Company, of Jersey City, N. J., have issued a little booklet of sixteen pages which sets forth in readable language the advantages of Dixon Graphite Brushes, these brushes, it is said, being composed almost entirely of high grade graphite prevent sparking and wear of the commutator. Dixon's graphite resistance rods are also mentioned in the same booklet, copies of which may be obtained on request.

Furnaces.—The Garrett-Tilley Company, Inc., 90 West street, New York, have issued a bulletin No. 40, which describes and illustrates their over-fired car type heat treating furnaces of accurate temperature for oil or gas fuel. This company states that they are specialists in accurate temperature furnace construction and manufacture a line of small accurate temperature furnaces for heat treating small articles, as well as building, annealing and case hardening furnaces for coal or coke fuel.

Prestina.—A new brass plating preparation produced by Dr. Friedrich Neubeck, of Schwanheim Am Main, Germany, is described in a little folder just issued by Adolf Neubeck, Inc., New York. This folder gives the advantages of Prestina, which include simplicity, brightness of deposit, constancy of bath and the employment of a simple single salt instead of the combination. The folder also contains complete directions for the use of the material. Copies of it may be had by writing to the above address.

Galvanizing.—The protection of iron and steel against corrosion is described in a recent pamphlet published by the Metal Treating and Equipment Company, of New York. The pamphlet contains four sections under the heads of corrosion, galvanizing, standard galvanizing process and how to figure galvanizing equipment. The chapter on galvanizing includes definitions of hot galvanizing, sherardizing and electro-galvanizing. This is a good booklet to have on hand and may be had by writing for same.

Pressure Gages and Meters.—Among recent catalogs issued by the Bristol Company, manufacturers of Bristol's recording pressure gages, Waterbury, Conn., are bulletins Nos. 143 and 173, which describe and illustrate Bristol's differential pressure gages and recording flow rate meters of the float type model, and catalog No. 1300, which is devoted to Bristol's class 3 recording thermometer having a temperature between 60 degs. below zero and 800 degs. F. Copies of these publications can be had on request.

Silica Retorts.—The Improved Equipment Company, combustion engineers, 60 Wall street, New York, have issued bulletin No. 6, which gives a full description of the application of their silica retorts and settings. Particular attention is called to the engineering data and curves which appear on pages 18 and 19 of the catalog. These curves are fusion curves and are from the combination of silica and alumina. On pages 21 and 22 is a description of the company's method of operating a gas producer which would undoubtedly interest a large number of our readers and it would be to their interest to send for the bulletin.

Molding Machines.—Mumford Molding Machines are listed in a handsome, well printed catalog of forty pages, No. 51, issued by the Vulcan Engineering Sales Company, of New York and Chicago. The list includes Mumford jolt rammers, for core bench or molding floor with pit drawing mechanism or without; Vulcan hand squeezers, high trunnion power squeezing machines, plain power squeeze, split pattern vibrator machines, open and split pattern machines and Mumford pneumatic vibrator with and without extensions and attachments. The book also contains a complete list of the users of various kinds of machines.

Boiler and Fuel Economizer.—The counter-current or multi-stage principle in steam generation, towards the adoption of which there appears to be a tendency in recent practice, is discussed in a pamphlet entitled "The Best Proportions of Boiler and Economizer Surface," issued by the Green Fuel Economizer Company, of Matteawan, N. Y. In this booklet a method is developed for determining the proper limits of boiler and economizer surface and it is shown that the most economical results are obtained from a boiler properly proportioned for transmitting the heat of evaporation, with an economizer for progressively warming the feed water. In addition to the above a forty-eight page catalog, No. 145, describes the products of this company, under the head of "What We Make."

METAL MARKET REVIEW

NEW YORK, July 7.

COPPER.

The month of June opened with the leading selling agents asking 15¾ cents for electrolytic and 15⅞ for Lake when the actual market at which copper could be bought was around 15½ to 15¼, and since then the price has declined to 14½ cents and the leading selling agents have come down to 15 cents—early in June a leading producer who sells his own copper, and watches the consuming trade instead of Wall street, made sales at 14¾ cents, and that is about the market price today. There is very little doing, but conditions generally in European financial circles are gradually getting into better shape and trade will quickly follow any permanent improvement abroad.

The exports for the month were not very heavy, 27,815 tons, against 38,601 tons in May. The European stocks of copper continue to decrease, since the middle of June the foreign stocks have decreased 1,810 tons, and this decrease has taken place it must be remembered in face of the heaviest exports for six months ever known. This does not look as though general trade in Europe had really suffered very much on account of the war. The copper market is in pretty good shape. 14¾ cents to 15 cents is a mighty good price for copper—it may go to 14 cents, and it is plenty good at that, but to push it up to artificial prices like the selling agents did in May will only mean the same kind of a break and lower prices each time.

The market today is around 14½ to 14¾ for electrolytic and 14⅞ for Lake, with casting obtainable 14⅜ cents.

TIN.

The London speculative tin market has had a bad smash, prices dropped from around 46¾ at the opening to 42.75, about the low point for the month, at the close the fluctuations have been very violent, the best posted man in the trade was just as much in the dark as an office boy; anyway tin has declined about 4 cents per pound and looks today particularly weak, because certain operators are today selling tin in this market at below the cost of import and that means that unless tin drops another pound or so in London all this tin will show a certain loss, as it does today.

Statistically the market is in pretty good shape, the stocks are about 2,600 tons less than a month ago and the price is nearly 5 cents a pound less, and on the face of it looks like a good buy, but it might be just as well to be on the safe side toss up about it.

Prices for 5-10 ton lots today are around 40.50, with futures a few points less it certainly looks cheap after 50 cents.

LEAD.

The trust price has been held at 4.35 New York basis the entire month, while the independents have been getting 2½ to 5 points more and closing at 4¾ for carload lots.

SPELTER.

The spelter has been sagging from 5.15 East St. Louis a month ago to 4.95 for spot, while the future months like July, August and September have been difficult to buy, and the price for August and September is 5 points or more above the spot price which is quotable today at 5.15 East St. Louis and 5.35 New York.

ALUMINUM.

The price of aluminum has declined about 2 cents per pound during the month. The market has been very dull, consumers did not seem anxious to buy ahead while the duty was still unsettled. Prices today domestic, 23 to 24 cents, against 25 to 25½ cents a month ago.

ANTIMONY.

Cookson's is about 20 points lower at 8.50, Hallett's is around 8 cents, with Hungarian grade 7½ to 7¾.

SILVER.

The silver market has declined about 1½ cent during the month, opening at 60 cents price declined to 57¾, and closed at 58½ cents.

QUICKSILVER.

The wholesale price is $39 a flask against $40 a month ago—jobbing lots at around $40.

PLATINUM.

Prices are unchanged. Hard is quotable at $51 per ounce, with ordinary refined at $46. Iridium is quotable at $85 per ounce.

SHEET METALS.

Sheet copper has been reduced to 20 cents base, this price is more or less nominal and can probably be shaded. Copper wire is obtainable at 15¾ cents base. Brass prices have all been reduced. High sheet brass wholesale is nominal at 14¾ base.

OLD METALS.

The market has been very dull and the copper scraps are all lower than a month ago. Europe has been buying a little but the trade is not by any means active.—J. J. A.

JUNE MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	15.50	14.75	15.10
Electrolytic	15.35	14.50	14.90
Casting	15.30	14.35	14.75
TIN	46.70	42.70	45.00
LEAD	4.40	4.35	4.35
SPELTER	5.35	5.10	5.25
ANTIMONY (Hallett's)	8.25	8.00	8.15
SILVER	60⅛	57¾	59.00

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

The figures for June and July will be published in the August number of THE METAL INDUSTRY.

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.

1912—Average for year, 16.70. 1913—January, 17; February, 15.50; March, 15⅛; April, 15.75; May, 15⅞; June, 15¾.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

Metal Prices, July 7, 1913

METAL PRICES.

	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free. Manufactured 2½c. per lb.	
Lake, carload lots	14.90
Electrolytic, carload lots	14.75
Castings, carload lots	14.50
TIN—Duty Free.	
Straits of Malacca, carload lots	40.50
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2¾c. per lb.	
Pig lead, carload lots	4.35
SPELTER—Duty 1¼c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	5.30
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars, and rods, 11c. per lb.	
Small lots, f. o. b. factory	26.00
100 lb. lots, f. o. b. factory	25.00
Ton lots, f. o. b. factory	23.50
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	8.50
Hallett's cask lots	8.25
Hungarian grade	7.75
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	40 to .45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	$1.50
BISMUTH—Duty free	$2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb.	.55
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	46.00
SILVER—Government Assay Bars—Duty free	.58½

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% ..... according to quantity	27 to 32
Silicon Copper, 20% ..... " "	34 to 36
Silicon Copper, 30% guaranteed " "	36 to 38
Phosphor Copper, guaranteed 10% " "	24 to 28
Phosphor Copper, guaranteed 15% " "	22 to 26
Manganese Copper, 25% ..... " "	25 to 29
Phosphor Tin, guaranteed 5% " "	61 to 63
Phosphor Tin, no guarantee.. " "	46 to 49
Brass Ingot, Yellow ..... " "	9½ to 11
Brass Ingot, Red ..... " "	13½ to 15
Bronze Ingot ..... " "	12¾ to 14
Manganese Bronze ..... " "	18½ to 20
Phosphor Bronze ..... " "	13 to 26
Casting Aluminum Alloys.... " "	22 to 25
PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
12.50 to 12.75	Heavy Cut Copper	14.00 to 14.25
12.25 to 12.50	Copper Wire	13.75 to 14.00
11.25 to 11.50	Light Copper	12.75 to 13.00
11.25 to 11.50	Heavy Mach. Comp.	12.75 to 13.00
7.50 to 7.75	Heavy Brass	8.50 to 8.75
6.75 to 7.00	Light Brass	7.75 to 8.00
7.00 to 7.35	No. 1 Yellow Brass Turnings	8.00 to 8.25
10.00 to 10.50	No. 1 Comp. Turnings	11.00 to 11.50
4.00 to ——	Heavy Lead	—— to 4.25
3.75 to ——	Zinc Scrap	4.00 to 4.25
8.00 to 10.00	Scrap Aluminum Turnings	10.00 to 12.00
13.00 to 17.00	Scrap Aluminum, cast, alloyed	15.00 to 18.00
17.00 to 18.00	Scrap Aluminum, sheet (new)	19.00 to 20.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

PRICES OF SHEET COPPER.

BASE PRICE, 20 Cents per Lb. Net.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
	SIZE OF SHEETS.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for **Circles and Segments** to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 1¼c. per lb. Cents per lb.

Carload lots, standard sizes and gauges, at mill ..... 7.00 less 8%

Casks, jobbers' prices ..... 8c.

Open casks, jobbers' prices ..... 8½c.

Metal Prices, July 7, 1913

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect July 1st, 1913, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¾	$0.16⅝	$0.18
Wire	.14½	.16⅝	.18
Rod	.14½	.17⅛	.19
Brazed tubing	.19¼	—	.22¾
Open seam tubing	.19¼	—	.22¾
Angles and channels, plain	.19¼	—	.22¾

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16	$0.17⅛	$0.19¼
Wire	.15¾	.17⅛	.19¼
Rod	.15¾	.18⅝	.20¼
Brazed tubing	.20½	—	.24
Open seam tubing	.20½	—	.24
Angles and channels, plain	.21	—	.24

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

16c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	21½c. per lb. base
100 lbs. to 300 lbs. in one order	22c. " " "
Less than 100 lbs. in one order	23½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 50 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	18c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	14½c.	" "
" " " Rectangular sheets other than Sheathing	17c.	" "
" " " Rod	14½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 24½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier	3-30	33c.	34c.	36c.	38c.
	3-30	34c.	35c.	37c.	39c.
21 to 24 inclusive	30-48	36c.	37c.	39c.	41c.
	48-60	39c.	40c.	42c.	44c.
25 and 26	3-30	35c.	36c.	38c.	40c.
	30-48	37c.	38c.	40c.	42c.
27	3-30	36c.	37c.	39c.	41c.
	30-48	39c.	40c.	42c.	44c.
28	3-30	37c.	38c.	40c.	42c.
	30-48	40c.	41c.	43c.	45c.
29	3-30	38c.	39c.	41c.	43c.
	30-48	42c.	43c.	45c.	47c.
30	3-30	39c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. Charges made for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	.	..	26	23	..	..	13	19	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	20	20	26	30	36
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb.	33	33½	33½	34	34½	35	35½	36	37	38	39	44	47

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19,	B. & S.	Gauge,	inclusive	$0.60
6	"	"	19,	"	"	"	.70
9	"	"	19,	"	"	"	.85
12	"	"	19,	"	"	"	1.00
15	"	"	19,	"	"	"	1.15
16	"	"	19,	"	"	"	1.20
18	"	"	19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.